

Analysis of Inorganic and Organic Contaminants in Freshwater Mussels from the Big Sunflower River, Mississippi: October 1993

by Henry E. Tatem, Charles R. Lee, WES Stuart Patterson, AScI, Inc. Lisa Lefkovitz, Battelle

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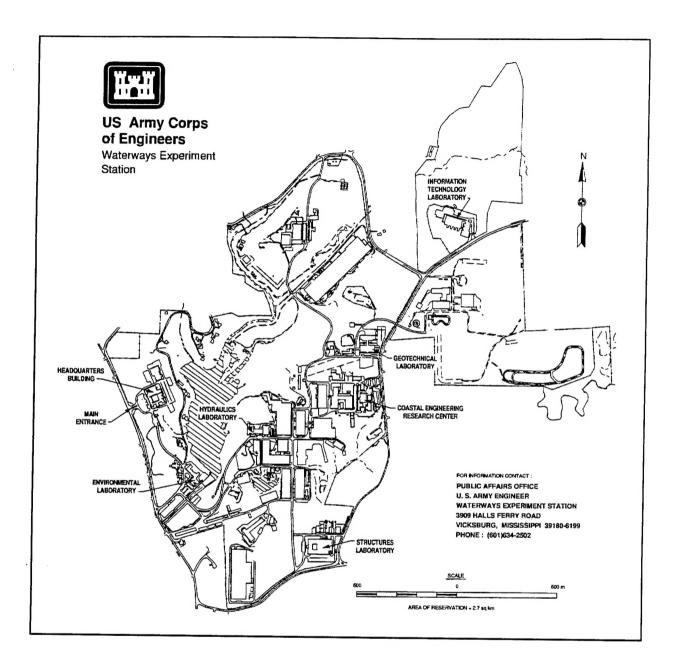
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Preface

The report herein contains chemical data on freshwater mussels taken from the Big Sunflower River, Mississippi. The work was conducted by the Environmental Laboratory (EL), U.S. Army Engineer Waterways Experiment Station (WES), Vicksburg, MS, for the U.S. Army Engineer District, Vicksburg. The Principal Investigator for this report was Dr. Henry E. Tatem, Fate and Effects Branch (FEB), Environmetal Processes and Effects Division (EPED), EL.

The report was prepared by Dr. Tatem, Dr. Stuart Patterson, AScI, Inc., Vicksburg, MS, Ms. Lisa Lefkovitz, Battelle Marine Sciences Laboratory, Sequim, WA, and Dr. Charles R. Lee, FEB. The authors acknowledge Drs. Andrew Miller and Barry Payne, Aquatic Ecology Branch, Ecological Research Division, EL, for collection and identification of the mussel species and Mr. Marvin Cannon of the Vicksburg District for support. Dr. Patterson and Ms. Joan U. Clarke, FEB, conducted statistical analyses of the data. Technical reviewers were Ms. Clarke and Dr. Michael Honeycutt, FEB.

The work was performed as a Contaminant Mobility and Assessment Team project, Dr. Lee, Team Leader. This project was conducted under the supervision of Dr. Bobby L. Folsom, Jr., Chief, FEB, Mr. Donald L. Robey, Chief, EPED, and Dr. John W. Keeley, Director, EL.

At the time of publication of this report, Director of WES was Dr. Robert W. Whalin. Commander was COL Bruce K. Howard, EN.

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1 Introduction

Marine and freshwater mussel species have been widely used to assess the contaminant status of aquatic ecosystems. They are good indicator species for aquatic contaminants because of their sedentary nature and lifestyle. Many freshwater mussels, also called clams or unionids, live for many years continuously filtering water for food particles and oxygen. They are normally closely associated with sediments that are known to adsorb contaminants such as pesticides and metals. The mussel species most widely used for contaminant monitoring is probably the marine blue mussel Mytilus edulis (Nelson 1990). Freshwater mussels, however, such as Anodonta and Lampsilis, are also used to assess aquatic ecosystem health (Burton, Nelson, and Ingersoll 1992). A recent review of the conservation status of North American freshwater mussels (Williams et al. 1993) describes freshwater mussels as good indicators of the overall health of aquatic ecosystems.

Fisher et al. (1992) provide an overview of mussels and contaminants and compare contaminant bioaccumulation by marine mussels with the freshwater zebra mussel *Dreissena polymorpha*, a recently established North American mussel species. It is not unusual for mussels to accumulate aquatic contaminants to concentrations much higher than the waters where they are found. For example, Doherty, Evans, and Neuhauser (1993) discuss research performed in the 1980s showing that the Asiatic clam *Corbicula* can contain metal and organic contaminants at concentrations greater than 1,000 times ambient water concentrations. This kind of dramatic bioconcentration data is not normally true for sediment comparisons. Mussel tissue concentrations of contaminants are generally similar to or only slightly higher than most sediment contaminant concentrations. Specific organic contaminants, however, such as pesticides, may be found in aquatic animal tissues at concentrations greater than sediment levels if the sediment concentrations are low.

It is reasonable to conclude from these studies that mussel species living in the Big Sunflower River, which flows through the Mississippi delta, could contain harmful environmental contaminants. The Mississippi delta is an intensive agricultural region east of the Mississippi River and north of Vicksburg, MS. The primary concern is with pesticides from agricultural crops. However, other contaminants such as polychlorinated

biphenyls (PCBs) and metals are generally widespread and are normally included in studies of the contaminant status of an ecosystem.

In connection with a planned maintenance dredging project on the Big Sunflower River, private companies have expressed an interest in harvesting certain mussel species for their shells (Huffman 1994). Current plans are to remove the mussel soft tissues from the shells and use the tissues as feed for farm animals. Questions may arise concerning the use of mussel tissues for animal feed. Obviously the tissues should not be used for animal feed if it is determined that they contain elevated concentrations of contaminants. There are little or no data available on the contaminant status of these Big Sunflower mussels. The purpose of this report is to determine the concentrations of three classes of contaminants (pesticides, PCBs, and metals) in the mussels and to determine the suitability of the soft tissues as animal feed.

2 Materials and Methods

Divers or people wading in shallow areas collected various mussel species from the Big Sunflower River, Mississippi, during September and October 1993. Animals were obtained from at least eight sites from River Miles 34.5 to 150 for the contaminant analyses. Live animals were transported to the U.S. Army Engineer Waterways Experiment Station (WES) Environmental Laboratory, Vicksburg, MS, as they were collected. At the laboratory, the animals were rinsed thoroughly with tap water and temporarily placed in aquaria containing aged tap water. Mussels were held in separate aquaria according to species and site. After 18 to 20 hr, they were killed by freezing and labeled by species and site. The animals were frozen and stored in a standard freezer (-5 °C) until all collections had been accomplished and efforts were made to obtain similar species from as many sites as possible. The statement of work called for tissue analyses of mussels from three to five sites along the Big Sunflower River, three species per site and possibly two size classes for each species. Mussel species were identified by the WES collection team. Additional information on these animals is available in a separate report (Miller and Payne, in preparation).

Animals were removed from the freezer, by species and site, and thawed; soft tissues were separated from the shells. Originally, each animal was maintained as one sample. After the shucking process was completed, the fresh weights of each sample were determined. The decision was made to use two animals as one sample for the larger species and to use three or four animals as a sample for the smaller species. The fresh wet tissues were homogenized and placed in precleaned sample jars (Eagle Picher, Miami, OK) and shipped to the chemical laboratory (Battelle Marine Sciences Laboratory at Sequim, WA) for analyses during November 1993. Not all species from each site were analyzed because of costs associated with this kind of work. In some cases, only a few animals of a particular species were obtained at a given site. Since more than five sites were sampled and at least two of the sites were located within less than 1 river mile, the decision was made to analyze animals from only one of these two sites. All metals except for mercury were analyzed by Inductively Coupled Plasma/Mass Spectrometry methods following digestion of aliquots with a mixture of nitric and perchloric acids. Mercury (Hg) was analyzed by Cold-Vapor Atomic Absorption Spectroscopy

methods. Pesticides and PCBs were analyzed using Gas Chromatography/ Electron Capture Detection methods following extraction with methylene chloride. Additional information and details on chemical analysis methods and references can be found in the appendixes of this report.

3 Results and Discussion

Table 1 contains information on sites sampled and species obtained for the contaminant analyses. Eight sites were sampled with a total of 29 to 30 different site-species combinations represented. Some species were found only at one site. Examples of these are Anodonta grandis and Lampsilis teres at River Mile (RM) 63.3 and Quadrula nodulata at RM 76.0. Species used for the chemical analyses are noted in Table 1. Three species were found at all or nearly all of the sites. These were Quadrula pustulosa, Amblema plicata, and Plectomerus dombeyanus. These species were selected for chemical analyses at as many sites as possible. RM 63.3 was found to contain the most species of the sites sampled for chemical analyses. Site 35.1 animals were not analyzed because of the close location of Site 34.5. Mussels from Site 34.5 were analyzed.

Chemical analysis data for six metals and six pesticides are presented in Tables 2-7. Data are organized by RM and mussel species. Complete data sets for all contaminants determined are available in Appendixes A and B of this report. The appendixes also include quality assurance/quality control (QA/QC) data for these analyses.

Figures 1-7 show mean (±SE) concentrations of selected contaminants found in one of the mussel species, Amblema plicata, tissues at seven of the eight Big Sunflower River sampling sites. Data on the number of mussels taken at each site are presented in Table 1. Color photographs of some of the Big Sunflower mussels collected for this study are shown in Figures 8-15. Two classes of contaminants, metals and pesticides, were found in the tissues. The metal concentrations are reported as parts per million (ppm) dry weight, while the pesticides are reported as parts per billion (ppb) wet weight. The mussels (all species) did not contain detectable concentrations of PCBs. PCBs were analyzed as Aroclors (1242, 1248, 1254, and 1260) and were not detectable at 5 ppb (Appendixes A and B). The data shown in Figures 1-7 indicate that these mussels (species A. plicata) contained both metal and pesticide contaminants at all of the sample locations. Contaminants shown in the seven figures include Cd (Figure 1), Hg (Figure 2), Pb (Figure 3), DDE (Figure 4), DDD (Figure 5), toxaphene (Figure 6), and DDT (Figure 7). The pesticide levels shown appear to be generally high. It is somewhat unusual to find this many pesticides at detectable concentrations in aquatic tissues. Similar

results were obtained for the other mussel species analyzed. These data and additional data for other mussel species are presented in Tables 2-7 and in the appendixes of this report.

The chemical data show that these adult freshwater mussels from the Big Sunflower River contain, in their soft tissues, detectable concentrations of nine metals, approximately 14 pesticides, and no PCBs (see Tables 2-7 and appendixes). There are no obvious sampling sites or species that were found to be completely uncontaminated or to contain only a few contaminants at low concentrations. Cadmium (Cd), for example, was found at concentrations ranging from 0.218 ppm at RM 62.2 (species P. dombeyanus) to 1.85 ppm for species Q. pustulosa at RM 34.5 (Table 2). Replicate sample tissue concentrations were in the same range for both species at both sites, and every species at every site contained detectable concentrations of Cd. All metals except for Cr were detected at every site. Chromium (Cr) concentrations were less than detection limits for all three species (A. plicata, P. dombeyanus, and Q. pustulosa) at RM 140/150. It is not unusual to find detectable levels of some metals in aquatic tissue samples.

Freshwater and marine mussels and other bivalves usually contain some metals. For example, Doherty, Evans, and Neuhauser (1993) analyzed zebra mussels, *Dreissena polymorpha*, from two power plants located in New York and Canada and found the following metals in the tissues:

| ppm (| wet wei | | | | | | | |
|-------|---------|------|------|-------|------|-----|------|-----|
| | Cd | Cr | Cu | Hg | As | Pb | Se | Zn |
| Range | <1.0 | <2.0 | 9.0 | <0.02 | <0.5 | <20 | <0.2 | 2.1 |
| | 0.6 | 14.0 | 16.0 | <0.1 | 0.53 | 100 | 0.25 | 6.2 |

These values would be approximately three to four times higher on a dry weight basis.

Mills et al.(1993) analyzed two mussel species from Lake Ontario and reported metals data on a dry weight basis. They stated that the levels of Cd, Ni, Pb, and Se were excessive and deserved further study. Their data are summarized below:

| ppm (dry weight) | | | | | | | | |
|------------------|-------|------|-------|------|-------|------|------|------|
| | Cd | Cr | Си | Hg | Ni | Pb | Se | Zn |
| Range | 3.03 | 2.41 | 2.57 | 0.08 | 3.58 | 1.80 | 3.10 | 70.8 |
| | 11.90 | 5.33 | 25.80 | 0.28 | 12.60 | 7.90 | 4.50 | 309 |

The literature data indicate that, in general, the Sunflower mussels do not contain substantially elevated concentrations of metals. Another way of interpretating these data is to compare the concentrations found in the mussel tissues with either the U.S. Food and Drug Administration (USFDA) action limits or the U.S. Fish and Wildlife Service (USFWS) predator protection limits (U.S. Environmental Protection Agency/U.S. Army Corps of Engineers (USEPA/USACE) 1994; Inmon, Smith, and Facemire 1993). These references contain tables for the action limits and predator protection limits (PPL) for some contaminants. The PPL for some of the metals are (ppm wet wt) Cd - 0.5, Cr - 0.2, Pb - 0.3, Hg - 0.1, Se - 0.5. The metal concentrations shown in Tables 2-4 are reported on a dry weight basis, which means that they would be lower on a wet weight basis. The mussels averaged over 80-percent moisture in their tissues. Most of the samples analyzed for this report do not exceed the PPL concentrations. The data, however, for Se and Cr (Tables 3 and 4) are within the PPL range and are a reason for caution.

The organic contaminant analyses, including the pesticides and PCBs, show many pesticides present. The pesticides found include aldrin, D-BHC, heptachlor epoxide; g-chlordane, a-chlordane, trans-nonachlor; 4,4'-DDE, dieldrin, 2,4'-DDD, 4,4'-DDD; endosulfan II, 4,4'-DDT, endosulfan sulfate; and toxaphene. Pesticide concentrations are reported in the tables and in the appendixes on a μ g/kg (ppb) wet weight basis. The PPL values for dieldrin and DDTM (DDT + metabolites) are 0.1 and 1.0 ppm, respectively. These values are generally much higher than those found in the Sunflower mussels. Other pesticides found in these mussels do not have PPL values. The USFDA action levels (USFDA 1987 and Lee et al. 1991) for some of the pesticides found in the Sunflower River mussels are given below for human food and animal feed (ppm wet weight):

| | Human Food | Animal Feed |
|--------------------|------------|-------------|
| внс | 0.3 | 0.05 |
| chlordane | 0.3 | 0.10 |
| DDT + DDE | 5.0 | 0.50 |
| toxaphene | 5.0 | 0.50 |
| dieldrin + aldrin | 0.3 | - |
| heptachlor epoxide | 0.3 | 0.01 |

Most of the DDTM values are less than one-fourth of the PPL criteria, but the mussels were shown to contain the pesticide toxaphene at concentrations equal to or greater than those for the DDTM and dieldrin. According to the USEPA water quality criteria chart, toxaphene is similar to dieldrin. Both pesticides are listed as carcinogens, and the freshwater chronic criteria are similar. The USFDA publication listing contaminant action levels (USFDA 1987) shows that acceptable concentrations for animal feed are all below the 1.0-ppm concentration. Some of the Big

Sunflower mussels had toxaphene concentrations that approached the USFDA action level of 0.5 ppm. This information, combined with the number of pesticides found, is an indication that these mussels should not be used as food for farm animals and that normal precautions should be used in handling and disposal of the tissues. The tissues should be disposed of at an approved landfill. The pesticide data suggest that additional study of toxaphene concentrations and sources in the Big Sunflower River ecosystem is warranted.

A statistical analysis of the contaminant data was performed. Data for all species were combined at each RM and compared with the PPL values (Table 8). Contaminants with PPL values were Cd, Cr, Pb, Hg, Se, dieldrin, and DDTM. The metals data were converted to wet weight for these analyses, using an average moisture content of 84 percent. Upper 95-percent confidence limits of the mean contaminant concentrations were calculated and compared with the PPL criteria. These statistical procedures are discussed in USEPA/USACE (1994) (Appendix D). The data showed that the 95-percent upper confidence limits (UCL) were not much higher than the actual data and that UCL for only two metals, Se and Cr, exceeded the PPL values. A summary of the statistical comparisons is shown in Table 8. Additional information is available in Appendix C of this report.

Data in Table 8 also may be used for general comparison of the relative contamination of RM sites along the Big Sunflower River. For some of the contaminants, there was little difference in the 95-percent UCL at each RM. Examples of this are data for Hg and Se. For other contaminants, these data are an indication that the mussels at one or more RMs are more contaminated compared with the other RMs. The best example of this is dieldrin, where the values at RM 76.0 and RM 79.2 were much lower than the values at the other five RM sites.

4 Summary

Chemical analyses of freshwater mussels taken from the Big Sunflower River, Mississippi, in 1993 showed that the mussels contained detectable concentrations of metals and pesticides. PCBs were not found at detectable concentrations. The metals found included Cd, Hg, Pb, Ni, Se, and Cr. Most aquatic animals contain detectable levels of metals in their tissues; however, the tissue concentrations found in these mussels were in a range that could be expected for animals taken from moderately contaminated sites. Tissue concentrations for two metals, Se and Cr, were greater (95-percent UCL) than the PPL at one (Se) or most (Cr) of the RM sites. The tissue concentrations are likely related to the age (>20 years) and lifestyles of these mussels. The pesticides identified in these mussels included chlordane, dieldrin, DDE, DDD, DDT, toxaphene, and others. These contaminants are not normally found in aquatic animals and indicate pesticides are present in this ecosystem. Tissue concentrations of pesticides are likely related to the age of the mussels and are probably not extremely high considering the heavy agricultural use of the Big Sunflower River watershed. Some concentration of contaminants was found for all species at all sites. Tissue concentrations (95-percent UCL) for dieldrin and DDTM did not exceed the PPL values. However, there is no PPL value for toxaphene. Toxaphene was found at all RMs and in all species at higher concentrations than any other pesticide. If toxaphene is judged by the dieldrin PPL, it is likely that the 95-percent UCL would exceed the PPL value of 100 ppb (0.1 ppm) for some of the RMs. Toxaphene was generally below the 100-ppb level at RMs 76.0 and 79.2. The USFDA action level for toxaphene in animal feed is 0.5 ppm or 500 ppb. Mussels analyzed from between RMs 60 and 70 revealed toxaphene concentrations of approximately one-half of this concentration.

These data, then, do not reveal an obvious overall trend that would suggest that the metal and pesticide contamination was specific to any particular species or site. Based on these data, it is recommended that mussel tissues not be used as food for farm animals, but be treated as an organic waste and disposed of at an approved landfill. It is possible that the usual feed for farm animals contains some concentration of metals and pesticides. This should be considered if there is some reason why landfill disposal would be a problem or if a local farmer wanted to use these mussels for feed knowing that they contained concentrations of metals and

pesticides. Normal precautions should be employed during handling and processing of these animals. They should not be used as food for people or disposed of in an aquatic habitat.

References

- Burton, G. A., Jr., Nelson, M. K., and Ingersoll, C. G. (1992). "Freshwater benthic toxicity tests." Sediment toxicity assessment. G. A. Burton, Jr., ed., Lewis Publishers, Ann Arbor, MI, 213-240.
- Doherty, F. G., Evans, D. W., and Neuhauser, E. F. (1993). "An assessment of total and leachable contaminants in zebra mussels (*Dreissena polymorpha*) from Lake Erie," *Ecotoxicology and Environmental Safety* 25, 328-340.
- Fisher, S. W., Gossiaux, D. C., Bruner, K. A., and Landrum, P. F. (1992). "Investigations of the toxicokinetics of hydrophobic contaminants in the zebra mussel (*Dreissena polymorpha*)." Zebra mussels biology, impacts, and control. T. F. Nalepa and D. W. Schloesser, ed., Lewis Publishers, Ann Arbor, MI, 465-490.
- Huffman, A. (1994). "Flexing mussels along the Sunflower River," Mississippi Wildlife 5(6), Dec./Jan. 1993-1994, 10-12.
- Inmon, L. E., Smith, S. B., and Facemire, C. F. (1993). "Contamination of the Sulfur River Wildlife Management Area and Watershed in and near Texarkana, Arkansas and Texas," Publication No. VI-91-4254, U.S. Fish and Wildlife Service, Vicksburg MS.
- Lee, C. R., Tatem, H. E., Brandon, D. L., Kay, S. H., Peddicord, R. K., Palermo, M. R., and Francingues, N. R., Jr. (1991). "General decisionmaking framework for management of dredged material: Example application to Commencement Bay, Washington," Miscellaneous Paper D-91-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.
- Miller, A. C., and Payne, B. S. "An analysis of freshwater mussels (Unionidae) in the Big Sunflower River, Mississippi, for the Big Sunflower River Maintenance Project: 1993 Studies," Technical Report in preparation, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

- Mills, E. L., Roseman, E. F., Rutzke, M., Gutenmann, W. H., and Lisk, D. J. (1993). "Contaminant and nutrient element levels in soft tissues of zebra and quagga mussels from waters of southern Lake Ontario," *Chemosphere* 27(8), 1465-1473.
- Nelson, W. G. (1990). "Use of the blue mussel, Mytilus edulis, in water quality toxicity testing and in situ marine biological monitoring," ASTM STP 1096, Aquatic toxicology and risk assessment: Thirteenth Volume. W. G. Landis and W. H. van der Schalie, ed., American Society for Testing and Materials, Philadelphia, PA, 167-175.
- U.S. Environmental Protection Agency/U.S. Army Corps of Engineers. (1994). "Evaluation of dredged material proposed for discharge in waters of the United States: Testing manual (draft)," U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.
- U.S. Food and Drug Administration. (1987). "Action levels for poisonous or deleterious substances in human food and animal feed," FDA Center for Food Safety and Applied Nutrition Guidelines and Compliance Research Branch, Washington, DC.
- Williams, J. D., Warren, M. L., Jr., Cummings, K. S., Harris, J. L., and Neves, R. J. (1993). "Conservation status of freshwater mussels of the United States and Canada," Fisheries 18(9), 6-22.

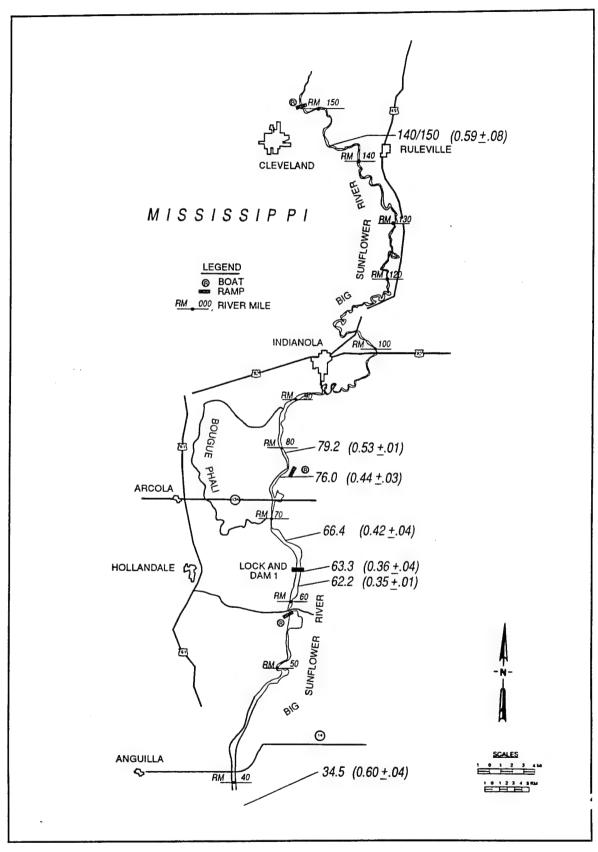


Figure 1. Mean \pm SE concentrations of Cd (ppm) in Big Sunflower River mussel Amblema plicata

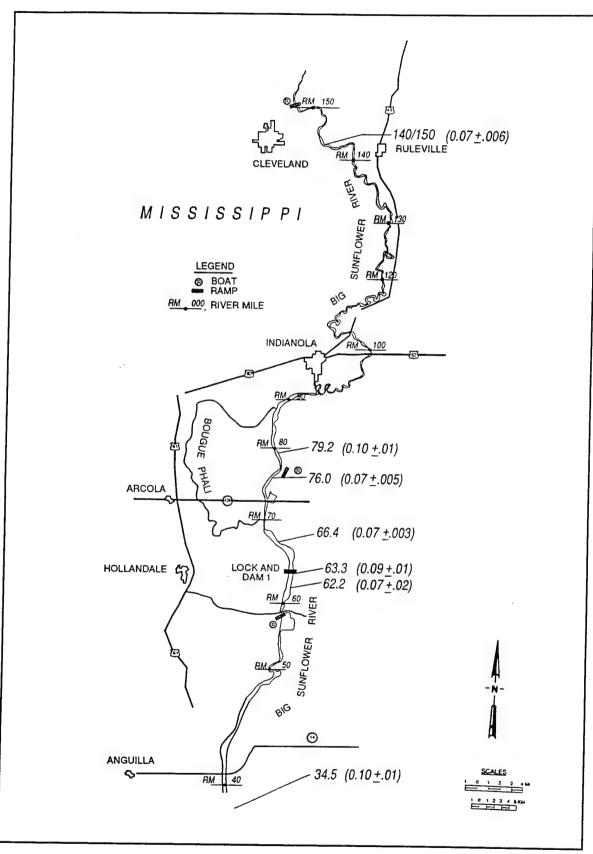


Figure 2. Mean \pm SE concentrations of Hg (ppm) in Big Sunflower River mussel Amblema plicata

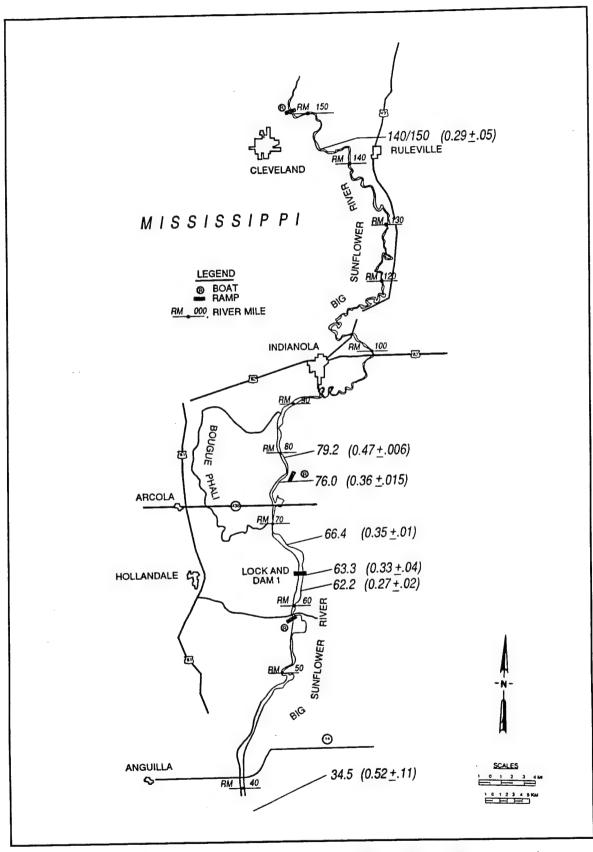


Figure 3. Mean \pm SE concentrations of Pb (ppm) in Big Sunflower River mussel Amblema plicata

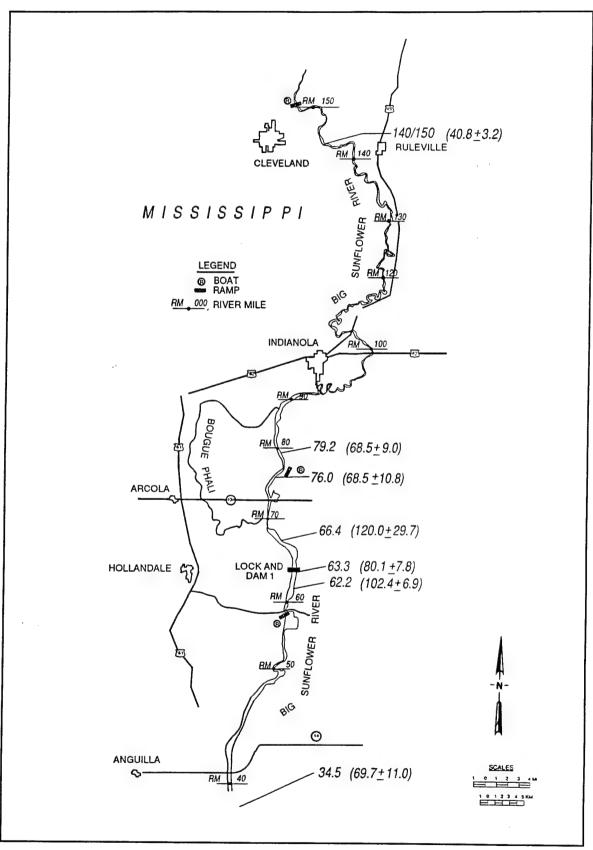


Figure 4. Mean ± SE concentrations of DDE (ppb) in Big Sunflower River mussel Amblema plicata

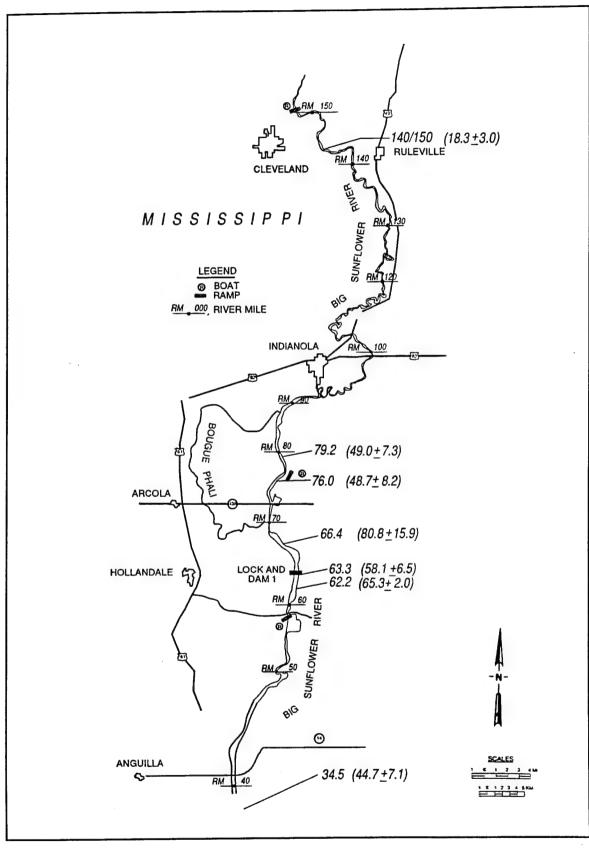


Figure 5. Mean \pm SE concentrations of DDD (ppb) in Big Sunflower River mussel Amblema plicata

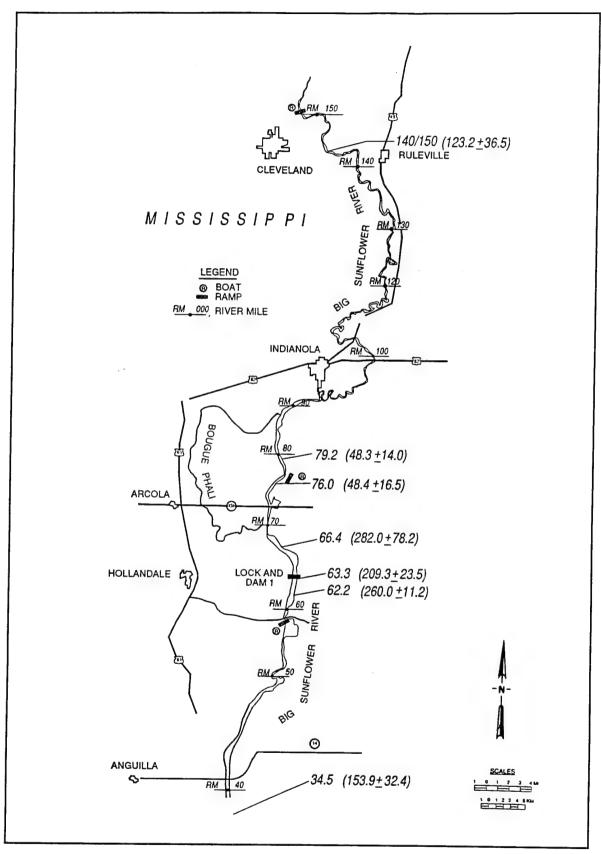


Figure 6. Mean \pm SE concentrations of toxaphene (ppb) in Big Sunflower River mussel Amblema plicata

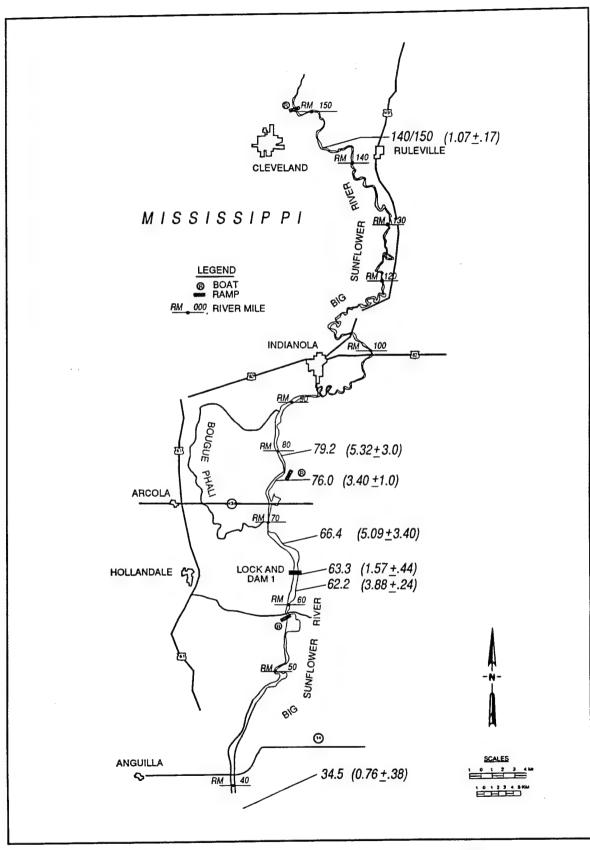
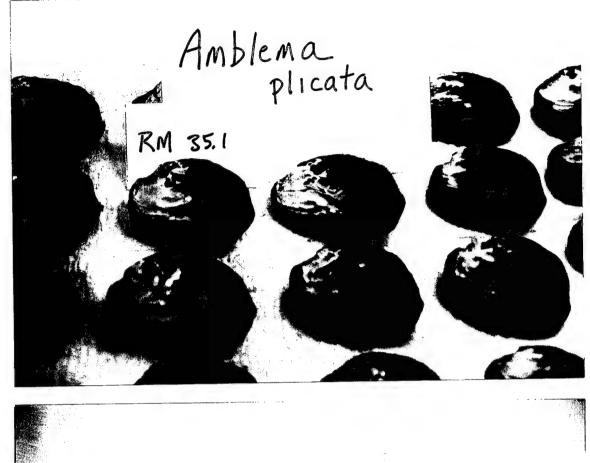


Figure 7. Mean \pm SE concentrations of DDT (ppb) in Big Sunflower River mussel Amblema plicata



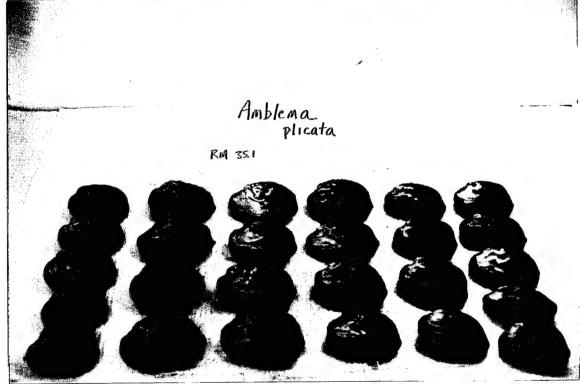
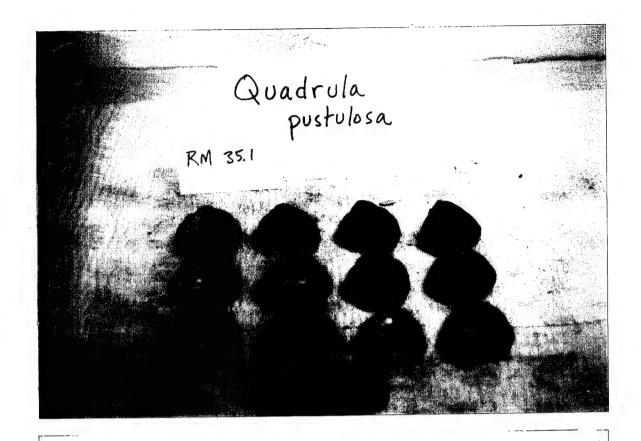


Figure 8. Amblema plicata from RM 35.1 on Big Sunflower River, Mississippi



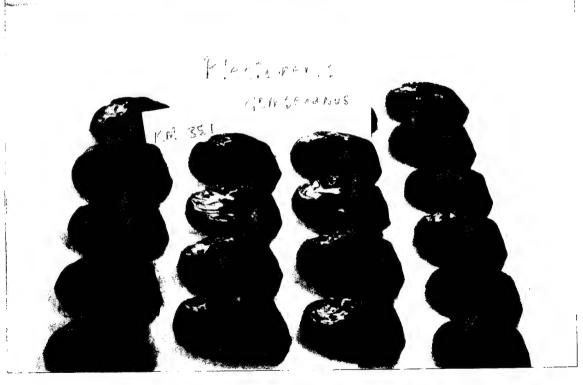


Figure 9. Quadrula pustulosa and Plectomerus dombeyanus from RM 35.1 on Big Sunflower River, Mississippi



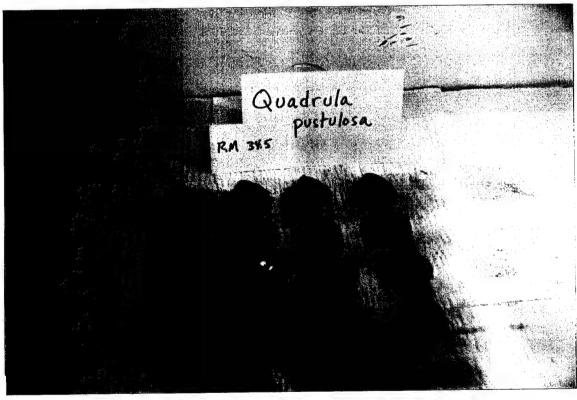


Figure 10. Amblema plicata and Quadrula pustulosa from RM 34.5 on Big Sunflower River, Mississippi

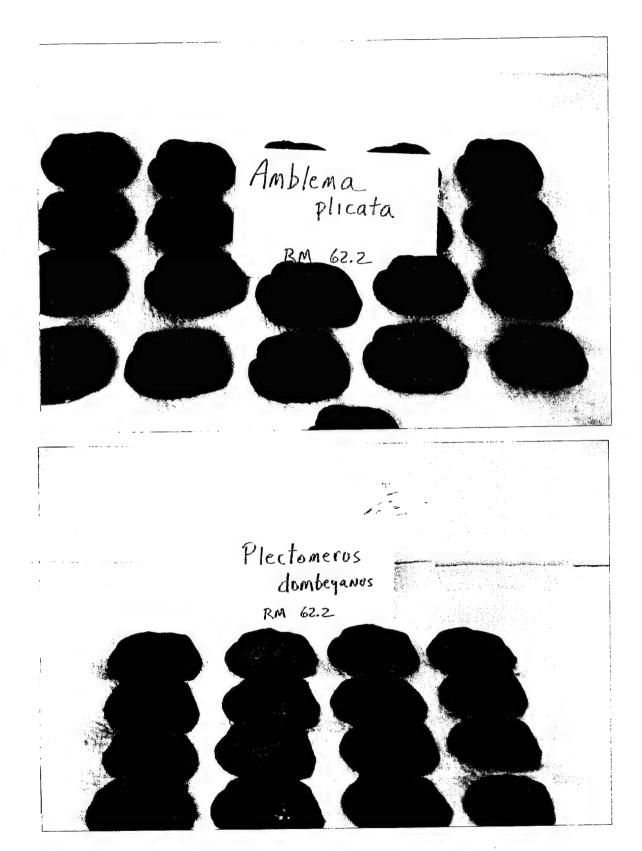
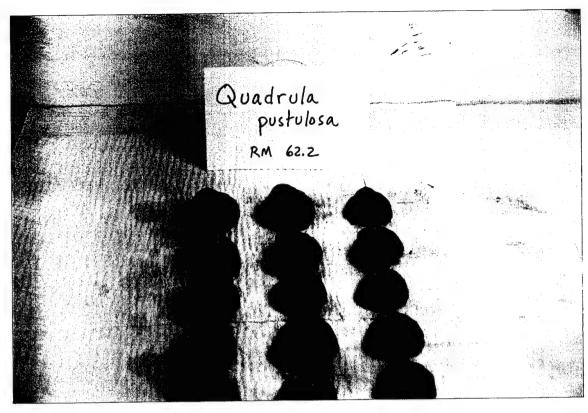


Figure 11. Amblema plicata and Plectomerus dombeyanus from RM 62.2 on Big Sunflower River, Mississippi



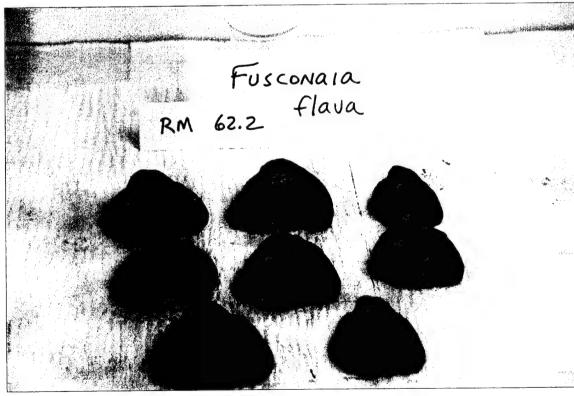


Figure 12. *Quadrula pustulosa* and *Fusconaia flava* from RM 62.2 on Big Sunflower River, Mississippi

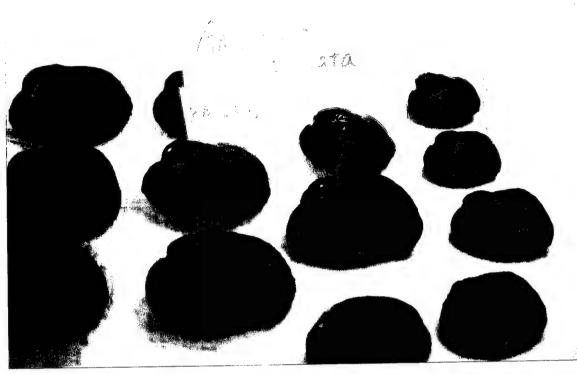




Figure 13. Amblema plicata and Anodonta grandis from RM 63.3 on Big Sunflower River, Mississippi



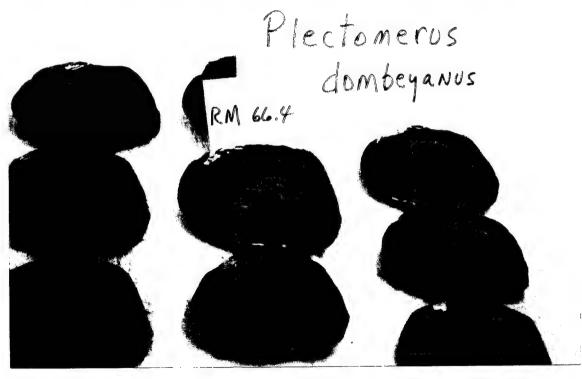


Figure 14. Plectomerus dombeyanus from RMs 34.5 and 66.4 on Big Sunflower River, Mississippi

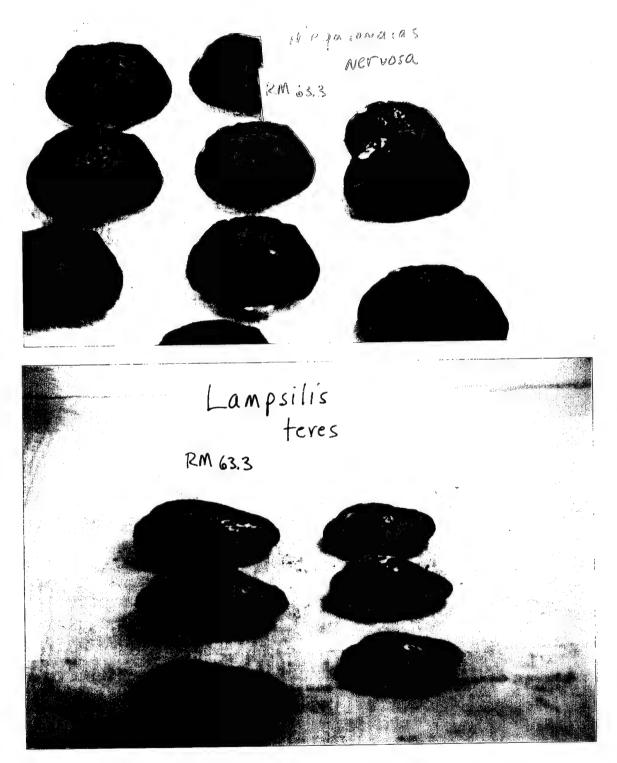


Figure 15. *Megalonaias nervosa* and *Lampsilis teres* from RM 63.3 on Big Sunflower River, Mississippi

Appendix A
Battelle Pacific Northwest
Division Marine Sciences
Laboratory Chemical Report,
20 January 1994



Marine Sciences Laboratory

January 20, 1994

1529 West Sequim Bay Road
Sequim, Washington 98382-9099
Telephone (206) 683-4151
Facsimile (206) 681-3699

Dr. Henry Tatem Waterways Experiment Station U. S. Army Corps of Engineers 3909 Halls Ferry Road Vicksburg, MS 39180-6199

Dear Henry:

Enclosed are summary tables containing the final results of metals, pesticides and PCB analyses for mussel samples. Metals results are included for all 69 tissue samples. Pesticides and PCB results are provided for the first batch of 35 samples. Pesticides and PCB results for the second batch of 34 remaining tissues will be provided within the next two weeks. Also included with this report are QA/QC summaries outlining the methods used and brief discussions of the data quality objectives for this project.

If you have any questions please call me at 206-681-3626.

Very truly yours

Lisa Lefkovitz
Environmental Chemist

:mkw

Enc.

QA/QC SUMMARY

PROGRAM:

WES MUSSELS

PARAMETER:

Metals

LABORATORY:

Battelle/Marine Sciences Laboratory, Sequim, Washington

MATRIX: SDG:

Tissue **676WES**

SAMPLE CUSTODY

A total of 69 mussel samples were received from WES on 11/18/93. Samples were received homogenized and an aliquot was subsampled into a clean tared Spex jar for metals analyses. Samples were assigned a Battelle Central File ID Number (676WES) and were logged into Battelles log-in system.

QA/QC DATA QUALITY OBJECTIVE

| | <u>Method</u> | Range of Recovery | SRM Accuracy | Relative Precision | (mg/kg dry wt.) Achieved Detection <u>Limit</u> |
|---|--|--|--|--|--|
| Arsenic Cadmium Chromium Copper Lead Mercury Nickel Selenium Zinc | ICP/MS ICP/MS ICP/MS ICP/MS ICP/MS ICP/MS ICP/MS ICP/MS ICP/MS | 75-125 75-125 75-125 75-125 75-125 75-125 75-125 75-125 75-125 | ≤20% ≤20% ≤20% ≤20% ≤20% ≤25% ≤20% ≤20% ≤20% | ≤25% ≤25% ≤25% ≤25% ≤25% ≤25% ≤25% ≤25% | 0.908 0.066 0.867 0.788 0.203 0.01 0.286 0.25 1.37 |

METHOD

A total of thirteen (9) metals were analyzed for this project:arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), mercury (Hg), nickel (Ni), lead (Pb), Selenium (Se) and zinc (Zn). Hg was analyzed using cold-vapor atomic absorption spectroscopy (CVAA) according to the method of Bloom and Crecelius (1983). The remaining metals were analyzed by inductively coupled plasma mass spectrometry (ICP/MS) following SOP MSL-M-025, Metals and Trace Elements in Sediment and Tissue by ICP/MS which is based on EPA method 200.8 (EPA 1991)

To prepare tissues for analysis, samples were freeze-dried and blended in a Spex mixer-mill. Approxiately 5 g of mixed sample was ground in a ceramic ball mill. For ICP/MS and CVAA analyses, 0.2- to 0.5-g aliquots of dried homogenous sample were digested using a mixture of nitric and perchloric acids.

HOLDING TIMES

After samples were homogenized, tissue samples were frozen to After samples were nomogenized, tissue samples were frozen to -80°C and subsequently freeze dried within approximately 14 days of sample receipt. Samples were all analyzed within 180 days of receipt with the exception of Hg which was analyzed within 28 days of sample collection. The following summarizes the specific dates of each analysis:

| Task | Date Performed |
|------------------|----------------|
| Sample Digestion | 12/27/93 |
| ICP-MS | 1/12/93 |
| CVAA-Hg | 1/6/93 |

QA/QC NARRATIVE/ TISSUE METALS (continued)

DETECTION LIMITS MDLs were determined by multiplying the standard deviation of 3

replicate blank spike analyses by 3.5 to approximate the student t value. All samples contained metals concentrations above the MDLs

with the exception of a number of Cr values.

METHOD BLANKS Four method blanks were analyzed with the samples. No metals were

detected above the MDLs in any of the blanks.

MATRIX SPIKES Two samples were spiked with all metals. All recoveries were within

the control limits of the 75-125% with the exception of one Zn spike recovery. This sample was spiked at a level 40 times below the native level in the sample making an accurate recovery difficult.

SRMs

SRM, 1566a (an oyster tissue obtained from the National Institute for Standards and Technology, NIST), was analyzed in duplicate with the samples for all metals. All results were within 20% of the certified value with the exception of Cr, Cu and Ni in one of the SRMs. Cr results,

however, are within the certified range of the SRM.

REFERENCES

Bloom, N. S., and E.A. Crecelius. 1983. "Determination of Mercury in Seawater at Sub-Nanogram per Liter Levels." Mar. Chem. 14:49-59.

EPA. 1991 Methods for the Determination of Metals in Environmental Samples. EPA-600/4-91-010. Environmental Services Division, Monitoring Management Branch.

QA/QC SUMMARY

PROGRAM: WES

PARAMETER: Pesticides and Polychlorinated Biphenyl (PCB) Aroclors

LABORATORY: Battelle/Marine Sciences Laboratory, Sequim, Washington

MATRIX: Mussel Tissue/ BATCH 1

SAMPLE CUSTODY

A total of 69 mussel samples were received from WES on 11/18/93. All samples were received in good condition. Samples were assigned a Battelle Central File ID Numbers (676WES) and were logged into Battelles log-in system. This QA/QC summary covers batch 1 samples only.

QA/QC DATA QUALITY OBJECTIVES

| | Reference Method | Range of Recovery | SRM Accuracy | Relative <u>Precision</u> | Detection Limit (dry wt) |
|-----------|---------------------|-------------------|-----------------|------------------------------|-----------------------------------|
| PCB Cong. | GC/ECD | 30-130%/ 50-150% | NA | ≤30% | Pest - 0.5 ng/kg PCB - 5 μg/kg |

METHOD

Tissue samples were extracted with methylene chloride using a roller under ambient conditions following SOP MSL-M-079, "Extraction and Clean-up of Sediment and Tissue for Semivolatile Organics following the Surrogate Internal Standard Method" based on EPA method 3510 and 8080 (EPA1986) and NOAA status and trends methodology (Krahn et al. 1988). Samples were then cleaned using Silica/Alumina (5% deactivated) chromatography followed by HPLC cleanup (Krahn et al. 1988). Extracts were analyzed using Gas Chromatography/Electron Capture Detection (GC/ECD) following SOP MSL-M-044, "Analysis of PCBs and Chlorinated Pesticides by GC/ECD" based on EPA method 8080 (1986). The column used was a J&W DB-17 and the confirmatory column was a DB-1701, both capillary columns (30m x 0.25mm I.D.).

QA/QC NARRATIVE/ MUSSELS Pest/PCBs (continued)

HOLDING TIMES

Samples were received on 11/18/93 in good condition. Samples were logged into Battelle's log-in system and stored at approximately -20° C until extraction. Samples were extracted in two batches. The first batch was extracted on 12/20/93. Extracts were analyzed by GC/ECD on 12/31/93, within the established holding time of 40 days from time of extraction (EPA 1986).

DETECTION LIMITS

All results are reported in $\mu g/kg$ wet weight. (Percent moistures are also given.) Target detection limits of 0.5 $\mu g/kg$ wet wt. for all pesticides and 5 $\mu g/kg$ wet wt for PCB Aroclors were achieved. Method detection limits were determined from multiplying the standard deviation of 7 spiked replicates by the student-t value. No statistical MDLs have been determined for Toxaphene, therefore the detection limit reported is based on the instrument detection limit.

METHOD BLANKS

One method blank was extracted with each extraction batch. No pesticides or PCBs were detected above the MDL in any of the blanks.

SURROGATES

Two compounds, PCB congeners 103 and 198, were added to all samples prior to extraction to assess the efficiency of the analysis. Sample surrogate recoveries for all samples were within the QC guidelines of 30-130% for both surrogates with the exception of PCB103 for one sample (611PNS*68). Except for the one surrogate recovery mentioned, all sample surrogate recoveries were within 50% of the recoveries of the SRM associated with the samples.

QA/QC NARRATIVE/ MUSSELS Pest/PCBs (continued)

MATRIX SPIKES

One sample from batch 1 was spiked in duplicate with 6 pesticides and with PCB Aroclor 1254. Matrix spike recoveries for all compounds were within the control limits of 50-150% with the exception of Aldrin which had recoveries of 218 and 238%. These high recoveries are due to some sort of matrix interference (since blank spike recoveries were acceptable, see below). Aldrin was only detected in one sample above the MDLs therefore, no corrective actions were taken.

BLANK SPIKES

The method blank was also spiked in duplicate with 6 pesticides and Aroclor 1254 prior to extraction. Recoveries for all compounds were within the control limits of 50-150%.

SRMs

No SRMs are presentely available for organics in tissue samples. We are waiting for re-certification of NISTs mussel tissue 1974.

REFERENCES

Krahn et al. "New HPLC Cleanup and Revised Extraction Procedures for Organic Contaminants," NOAA Technical Memorandum NMFS F/NWC-153. 1988.

U.S. Environmental Protection Agency (EPA). 1986. <u>Test Methods for Evaluating Solid Waste:</u> <u>Physical/Chemical Methods.</u> SW-846. U.S. Document No. 955-001-00000, U.S.E.P.A., Washington D.C.

| METALS IN MUS (CF #676WES) | METALS IN MUSSEL TISSUE SAMPLES (CF #676WES) | | | | | | | | | |
|-------------------------------|---|-------------|--------|---------|-------------|--------------------------|-------|--------|--------|--------|
| | ı | | | | (concentral | (concentrations in µg/g) | (6) | | | |
| MCI Codo | | As | 8 | | ਠ | 욷 | Ž | æ | ക | |
| MOL COOR | Sporisor ID | CPARS | ICP/WS | CPARS | ICP/MS | CVAA | CPAKS | ICPANS | ICPANS | ICP/MS |
| 676WES- 1 | 622AP01 | 6.91 | 0.373 | 1 37 | 7. | 000 | 6 | 0 | | |
| 676WES- 2 | 622AP03 | 5.73 | 0.341 | 10.1 | . r | 0.000 | 20.0 | 0.320 | 2.35 | 332 |
| 676WES- 3 | 622AP06 | 5 97 | 0.334 | 9.00 | , u | 00.0 | 2.04 | 0.243 | 2.84 | က |
| 676WES- 4 | 622PD01 | 6.20 | 0.23 | 1 12 | 5.20 | 0.020 | 41.5 | 0.251 | 2.92 | 36 |
| 676WES- 5 | 622PD03 | 6.01 | 0.240 | 1 24 | 2.07 | 0.03 | 4. 4 | 0.254 | 2.86 | 153 |
| 676WES- 6 | 622PD05 | 7.73 | 0.277 | 1.14 | S - 5 | 0.073 | 60.0 | 0.323 | 3.00 | - (|
| 676WES- 7 | 622QP01 | 4.90 | 0.915 | 2.10 | 5 42 | 120 | 20.7 | 0.503 | N. 0 | 247 |
| | 622QP02 | 4.91 | 0.945 | 1.89 | 5.12 | 0.123 | 1.67 | 0.022 | 0.0 | 7 7 |
| 0, | 622QP03 | 5.06 | 1.01 | 1.84 | 5.20 | 0.128 | 1 49 | 0.359 | 27.5 | |
| _ | 633AP02 | 4.92 | 0.436 | 1.45 | 4.77 | 0.117 | 66 | 0.407 | 200 | 1 4 6 |
| | 633AP03 | 5.22 | 0.306 | 0.867 U | 5.63 | 0.083 | 1.57 | 0 269 | 2.20 | 007 |
| • | 633AP05 | 4.38 | 0.349 | 1.15 | 5.46 | 0.080 | 1.65 | 0.326 | 2.5 | |
| | 633AG01 | 9.14 | 0.797 | 1.63 | 4.76 | 0.090 | 4.17 | 1.26 | 3.04 | 423 |
| • | 633AG02 | 7.40 | 0.794 | 0.867 U | 5.76 | 0.062 | 4.24 | 0.637 | 2.48 | 234 |
| | 633AG03 | 11.2 | 1.15 | 1.35 | 6.52 | 0.072 | 6.71 | 0.911 | 3.08 | 410 |
| | 633PD01 | 5.66 | 0.419 | 1.40 | 5.98 | 0.085 | 2.82 | 0.477 | 3.02 | . " |
| | 633PD03 | 6.60 | 0.537 | 1.24 | 6.36 | 0.114 | 3.45 | 0.619 | 2.45 | 270 |
| | 633PD04 | 7.36 | 0.332 | 1.96 | 7.60 | 0.104 | 3.28 | 0.669 | 2.64 | 314 |
| | 66RAP01 | 5.74 | 0.448 | 1.32 | 4.92 | 0.067 | 2.65 | 0.365 | 2.23 | 397 |
| 676WES- 20 | 664AP03 | 5.17 | 0.342 | 0.867 U | 6.32 | 0.075 | 1.34 | 0.332 | 2.05 | 214 |
| | 664BD04 | 6.26 | 0.464 | 0.960 | 6.51 | 0.075 | 2.43 | 0.357 | 2.18 | 290 |
| | 564PD03 | 9.28 | 0.2/5 | 1.09 | 5.38 | 0.089 | 1.70 | 0.316 | 2.40 | 307 |
| | 664 000 | 0.23 | 0.280 | 1.88 | 4.68 | 0.099 | 2.20 | 0.280 | 2.38 | 222 |
| | 345 A DA 4 | 9.24 | 0.313 | 1.69 | 4.59 | 0.079 | 1.85 | 0.323 | 2.22 | 206 |
| | 245 4 0 0 0 | 0.0 40.1 | 0.529 | 1.33 | 5.26 | 0.085 | 3.41 | 0.328 | 2.70 | 313 |
| | 345APU3 | 5.75 | 0.639 | 1.86 | 4.02 | 0.128 | 5.10 | 0.550 | 2.29 | 478 |
| | 343AF06 | 6.36 | 0.627 | 1.67 | 4.68 | 0.088 | 4.66 | 0.687 | 2.21 | 544 |
| 676WES- 28 | 345FD01 | 5.19 | 0.477 | 1.21 | 5.49 | 0.089 | 3.01 | 0.367 | 2.50 | 3 |
| | 345PU03 | 00.9 | 0.503 | 0.935 | 6.32 | 0.082 | 2.83 | 0.443 | 2.87 | 243 |
| | | | | | | | | | | |
| | | | | Č | | | | | | |

| MSL Code Sponsor ID | | | | | testaconoc | (s/s ri suchtestrations) | - | | | |
|---------------------|--------|--------|--------|---------|------------|--------------------------|--------|--------|--------|--------|
| Spor | 1 | As | 8 | Ö | 3 | Ha Ha | Z | æ | B | Z |
| | Q | ICPANS | ICPANS | ICPANS | ICPANS | CVAA | ICP/WS | ICPANS | ICPANS | ICP/MS |
| 676WES- 30 345PD04 | 4 | 6.74 | 0.355 | 0.926 | 5.59 | 0.088 | 2.86 | 0.380 | 2.97 | 26 |
| 676WES- 31 345QP01 | - | 4.89 | 1.85 | 1.76 | 6.75 | 0.179 | 2.95 | 0.720 | 4.26 | 210 |
| 676WES- 32 345QP02 | 8 | 4.43 | 1.46 | 1.68 | 6.03 | 0.161 | 2.14 | 0.653 | 3.34 | 213 |
| 33 | e 6 | 4.93 | 1.56 | 2.01 | 5.90 | 0.156 | 2.39 | 0.553 | 3.21 | 210 |
| . 34 | JAP01 | 5.07 | 0.531 | 0.867 U | 6.85 | 0.069 | 1.99 | 0.250 | 2.40 | 314 |
| 35 | JAP02 | 4.61 | 0.494 | 0.867 U | 6.75 | 0.063 | 2.02 | 0.232 | 2.28 | 300 |
| 36 | DAP03 | 4.82 | 0.756 | 0.867 U | 7.29 | 0.084 | 2.70 | 0.398 | 2.22 | 377 |
| - 37 |)PD01 | 5.51 | 0.304 | 0.867 U | 5.65 | 0.079 | 1.68 | 0.298 | 2.30 | 143 |
| 38 | OPD02 | 5.02 | 0.320 | 0.867 U | 6.04 | 0.083 | 2.07 | 0.289 | 2.46 | 149 |
| 39 | PD03 | 5.25 | 0.315 | 0.867 U | 5.24 | 0.084 | 1.87 | 0.271 | 2.04 | 175 |
| 40 | 1QP01 | 3.03 | 0.650 | 0.867 U | 5.82 | 0.085 | 0.894 | 0.232 | 2.31 | 110 |
| 41 | 1QP02 | 2.84 | 0.403 | 0.867 U | 5.16 | 0.074 | 1.03 | 0.169 | 2.43 | 100 |
| 42 | 0QP03 | 3.10 | 0.614 | 0.867 U | 7.87 | 0.087 | 1.1 | 0.323 | 2.27 | 132 |
| . 43 | - | 6.51 | 0.585 | 1.18 | 4.31 | 0.105 | 2.42 | 0.630 | 3.25 | 341 |
| 44 | 2 | 4.89 | 0.406 | 0.867 U | 4.09 | 0.080 | 1.92 | 0.394 | 2.92 | 246 |
| 45 | 8 | 5.22 | 0.635 | 0.867 U | 3.89 | 0.109 | 2.36 | 0.558 | 2.57 | 350 |
| 46 | _ | 4.50 | 969.0 | 2.82 | 5.14 | 0.120 | 1.50 | 0.407 | 2.47 | 140 |
| 47 | 2 | 4.36 | 0.764 | 2.48 | 6.29 | 0.133 | 1.17 | 0.539 | 2.32 | 116 |
| | 5 | 4.49 | 0.411 | 0.867 U | 5.24 | 0.069 | 968.0 | 0.267 | 2.35 | 102 |
| 49 | 11 | 5.53 | 0.658 | 1.00 | 10.2 | 0.164 | 3.04 | 0.811 | 2.82 | 248 |
| 20 | 22 | 4.75 | 0.459 | 0.949 | 8.22 | 0.277 | 1.99 | 0.441 | 3.67 | 234 |
| 2 | 33 | 5.48 | 0.536 | 1.10 | 8.76 | 0.264 | 3.02 | 0.712 | 3.00 | 302 |
| 25 | = | 4.29 | 0.397 | 1.41 | 4.84 | 0.065 | 1.59 | 0.357 | 1.76 | 248 |
| 23 | 2 | 5.55 | 0.426 | 1.53 | 5.10 | 0.077 | 1.59 | 0.328 | 2.10 | 239 |
| 54 | 83 | 6.25 | 0.485 | 2.29 | 6.21 | 0.081 | 2.25 | 0.380 | 2.21 | 398 |
| 22 | = | 4.61 | 1.01 | 2.91 | 4.88 | 0.119 | 1.56 | 0.476 | 2.39 | 167 |
| 676WES- 56 792QP02 | 2 | 5.26 | 0.645 | 3.87 | 5.36 | 0.086 | 1.43 | 0.545 | 2.74 | 150 |
| 676WES- 57 792QP03 | 53 | 4.34 | 1.01 | 4.18 | 5.04 | 0.123 | 1.74 | 0.577 | 2.55 | 162 |
| 676WES- 58 792AP01 | Ξ. | 4.80 | 0.514 | 2.39 | 5.35 | 0.086 | 2.44 | 0.456 | 1.93 | 359 |

| METALS IN MUSS (CF #676WES) | USACE - WESTATEM METALS IN MUSSEL TISSUE SAMPLES (CF #676WES) | | | | | | | | | |
|--------------------------------|---|---------|---------|---------|----------------|--------------------------|---------|---------|----------|------------|
| | ł | As | 8 | ර | concentrat | (concentrations in µg/g) | iz iz | £ | 8 | 70 |
| MSL Code | Sponsor ID | ICP/WS | ICP/MS | ICPARS | ICPAMS | CVAA | ICPARS | ICPANS | ICPANS | ICP/MS |
| 676WES- 59 | 792AP03 | 4.92 | 0.518 | 2.45 | 7. 7. | 0.087 | 9.57 | 0.476 | 1 76 | 36 |
| 676WES- 60 | 792AP04 | 5.51 | 0.548 | 4.06 | 6.09 | 0.114 | 2.25 | 0.469 | 2 42 | 350 |
| . 61 | 792PD01 | 5.83 | 0.246 | 1.54 | 4.16 | 0.087 | 1.50 | 0.292 | 2.49 | 149 |
| - 62 | 792PD02 | 7.58 | 0.345 | 1.85 | 4.85 | 0.097 | 1.87 | 0.399 | 2.10 | 232 |
| . 63 | 792PD03 | 5.05 | 0.269 | 2.16 | 4.82 | 0.091 | 1.90 | 0.375 | 2.19 | 226 |
| 64 | 633LT02 | 6.53 | 0.856 | 0.867 U | 3.67 | 0.089 | 2.18 | 0.373 | 3.05 | 377 |
| 65 | 633LT03 | 6.36 | 1.44 | 0.867 U | 4.31 | 0.103 | 3.31 | 0.404 | 3.14 | 618 |
| 99 | 533LT04 | 4.68 | 0.822 | 0.867 U | 3.95 | 0.100 | 2.26 | 0.297 | 2.58 | 467 |
| . 67 | 664QP01 | 3.85 | 0.702 | 2.60 | 5.81 | 0.117 | 2.26 | 0.702 | 2.86 | 153 |
| 89 | 664QP02 | 3.89 | 0.836 | 2.23 | 4.65 | 0.110 | 2.01 | 0.504 | 2.25 | 132 |
| 676WES- 69 (| 664QP04 | 4.07 | 0.786 | 2.02 | 4.62 | 0.104 | 1.92 | 0.637 | 2.55 | 144 |
| Biank-1 | | 0.908 U | 0.066 U | 0.876 U | 0.788 U | 0.010 U | 0.286 U | 0.203 U | 0.250 11 | 1 37 11 |
| Blank-2 | | 0.908 U | 0.066 U | 0.876 U | 0.788 U | 0.010 | 0.286 U | 0.203 U | 0.250 U | 1.37 U |
| Blank-3 | | | 0.066 U | 0.867 U | 0.788 U | 0.010 | 0.286 U | 0.203 U | 0.250 U | 1.37 U |
| Blank-4 | | 0.908 U | 0.066 U | 0.867 U | 0.788 U | 0.010 U | 0.286 U | 0.203 U | 0.250 U | 1.37 U |
| detection limits | | 906.0 | 990.0 | 0.867 | 0.788 | 0.010 | 0.286 | 0.203 | 0.250 | 1.37 |
| STANDARD REFERENCE | RENCE MATERIAL | | | | | | | | | |
| 1566a-1 1566a-2 | - o | 13.3 | 3.90 | 1.25 | 59.5 51.0 # | 0.064 | 2.09 | 0.353 | 2.66 | 753 669 |
| | certified value | 14.0 | 4.15 | 1.43 | 66.3 | 0.0642 | 2.25 | 0.371 | 2.21 | 830 |
| | | ! : | | ì | | | | 4.0.0H | ±0.24 | / G = |
| | | | | | | | | | | |
| | | | | 0,000 | | | | | | |

| Z | NV d |
|---|-------|
| B | 28.80 |

1/20/94

USACE - WES/TATEM
METALS IN MUSSEL TISSUE SAMPLES
(CF #676WES)

| (CL #6/6WES) | | | | | (concentrat | (concentrations in µg/g | , | | | |
|------------------|------------|--------|--|--------|-------------|-------------------------|-------|--------|------------|--------|
| | | As | 8 | Ö | 3 | £ | Z | £ | B | Zu |
| MSL Code | Sponsor ID | ICPANS | ICPANS | ICP/MS | ICP/MS | CVAA | CPARS | ICPANS | ICPANS | ICPANS |
| | | | | | | | | | | |
| MATRIX SPIKE | RESULTS | | | | | | | | | |
| of the second | | u | ıc | uc | ĸ | ĸ | ß | ĸ | ĸ | 5 |
| Amount Spiked | | 7 6 | 7.0 | . 6 | 5.90 | 0.157 | 2.39 | 0.554 | 3.21 | 210 |
| 6/6WES-33 | 040010 | 1.34 | | 6.37 | 68 | 4.08 | 6.47 | 5.30 | 7.47 | 211 |
| 6/6WE3-33 + | Builds | 30.6 | 4.56 | 4.36 | 3.99 | 3.92 | 4.08 | 4.75 | 4.26 | 1.00 |
| Amount Recovery | ery ery | 94% | 91% | 87% | 80% | 78% | 82% | 95% | 85% | 20% |
| | | u | Ľ | LC. | ĸ | ĸ | ıo | 150 | S | 22 |
| Amount Spiked | משטמטר | 96 7 | 0 645 | 3 87 | 5.36 | 0.086 | 1.43 | 0.545 | 2.74 | 150 |
| 676WES-56 | Childs | 03.0 | 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2 | 8.18 | 9.30 | 5.19 | 5.43 | 5.42 | 7.19 | 156 |
| America Docu | Spine | 4.36 | 4.51 | 4.31 | 3.94 | 5.10 | 4.00 | 4.88 | 4.45 | 00.9 |
| Percent Recovery | Verec. | 87% | %06 | 86% | 79% | 102% | %08 | %86 | %68 | 120% |
| | | | | | | | | | | |

• = Recovery outside of control limits (±20%)
= Recovery outside of control limits (75-125%)
U = Not detected at or below detection limits shown.
NA = Not applicable.

Page 4

| HEXA- CLCR GLCR GLCR GLCR GLCR GENZENE GBHC GLS U 0.68 U 0.24 U 0.12 U 0.07 U 0.68 U 0.24 U 0.12 U 0.07 U 0.08 U 0.25 U 0.12 U 0.07 U 0.08 U 0.75 U 0.25 U 0.12 U 0.08 U 0.75 U 0.25 U 0.12 U 0.08 U 0.75 U 0.26 U 0.12 U 0.08 U 0.75 U 0.26 U 0.12 U 0.08 U 0.73 U 0.26 U 0.12 U 0.08 U 0.73 U 0.26 U 0.12 U 0.08 U 0.73 U 0.25 U 0.12 U 0.08 U 0.73 U 0.26 U 0.12 U 0.08 U 0.09 U 0.07 U 0.09 U 0.09 U 0.07 U 0.09 U 0.09 U 0.07 U 0.09 U 0.09 U 0.00 | USACE - W PESTICIDE BATCH 1 | USACE - WES/TATEM PESTICIDES IN MUSSEL TISSUE SAMPLES BATCH 1 | SAMPLES | | | | | | | (concentratio | concentrations in ua/ka wet wt.) | wet wt.) | | |
|---|-----------------------------------|---|----------------|----------|--------|-------|----------|----------------|---|---------------|----------------------------------|-----------------------|-------|--------|
| \$\text{Started}{5}\$ \$622APD3 \$1.220/93 \$19.2 20.90 \$0.68 \$1.200.24 \$0.11 \$0.07 \$1.220/93 \$1.200.25 \$1.200. | MSLCode | Clinospool | д с | Extract | % Dry | | % | Surre | ogate veries | HEXA- | | | EPTA- | |
| \$\text{Started}{Started}{\text{1}} 112/20/93 1828 2120 8172 187% 138% 068 U 024 U 0.12 U 0.07 U 0.2 U 0.12 U 0.07 U 0.12 U 0.12 U 0.07 U 0.12 U 0.12 U 0.07 U 0.12 | | | Dalci | Dale | Meign | | Moisture | PCB 103 | PCB 198 | BENZEME | a-BHC | 2 8 2 8 2 | ALO3 | ALDRIN |
| \$\text{Septence}{5.5} \tag{5.624P03} \tag{6.112.00.93} 6.112. | 676WES- | 1 622AP01 | - | 12/20/93 | | | 81.72 | 19.7% | | 0.68 | | | | 1 60 0 |
| \$\frac{5}{2}\$ \text{5}{4} \text{5}{6} \text{5}{7} \tex | 676WES- | | - | 12/20/93 | | | 80.88 | 77.6% | 62.0% | | | 0.12 ∪ | | |
| ### Care Pools 12/20/93 16.34 20.53 81.66 77.5% 50.3% 0.68 U 0.24 U 0.12 U 0.07 U 0.07 U 0.02 U 0.22 DOGG 12/20/93 17.63 17.63 17.63 1.65 0.06 | 676WES- | | - | 12/20/93 | | | 82.25 | 80.6% | 62.8% | | | 0.12 U | | |
| \$\text{SEZPD03}\$\tag{5.50}\$5 | 6/6WES- | 4 622PD01 | - | 12/20/93 | | | 81.66 | 72.6% | 57.1% | | | | | |
| Secretary 12/20/93 17.27 19.33 27.75% 60.6% 0.72 U 0.25 U 0.13 U 0.08 U 0.8 U | 676WES- | 5 622PD03 | _ | 12/20/93 | | | 82.17 | 67.7% | 50.3% | | | 0.11 U | | 0.09 U |
| 8- 8 6220P02 | 676WES- | 7 6220P01 | | 12/20/93 | 21.18 | | 78.82 | 77.6% | 60.6% | | 0.25 U | 0.12 U | | |
| Seconds 1 (2/20/93 18.77 13.78 81.78 | 676WES- | R 6220P02 | | 12/20/83 | | | 82.73 | 75.3% | 59.8% | 0.75 U | | 0.13 U | | |
| Seriosando (12/20/93 14.54 20.00 16.13 | 676WES- | 9 6220P03 | | 12/20/93 | • | | 80.82 | 67.6% | 54.4% | 0.78 U | | 0.13 U | | |
| S. 11683AP03 1 12/20/93 14/38 21/31 65.12 71.5% 65.9% 0.65 U 0.23 U 0.11 U 0.07 U 0.03 U 0.12 U 0.07 U 0.03 U 0.11 U 0.07 U 0.03 U 0.11 U 0.07 U 0.03 U 0.12 U 0.03 U 0.12 U 0.07 U 0.03 U 0.12 U 0.03 U 0.12 U 0.07 U 0.02 U 0.12 U 0.03 U 0.12 U 0.02 U 0.12 U 0.12 U 0.12 U 0.02 U 0.12 | 676WES- | 10 633AP02 | - | 12/20/93 | 14.54 | 20.04 | 85.46 | 69.0% 69.0% | 62.3% | 0.750 | 0.60 0 | 0.13 U | | |
| 5. 12 833APO5 1 2/20/93 15.47 22.02 84.53 75.3% 65.5% 0.56 U 0.22 U 0.10 U 0.07 U 0.07 U 5. 13 83AGO2 1 2/20/93 14.77 19.64 86.23 80.0% 60.2% 0.46 U 0.16 U 0.08 U 0.07 U 5. 14 833AGO2 1 2/20/93 14.77 19.64 86.23 80.0% 60.2% 0.74 U 0.12 U 0.07 U 5. 16 833AGO2 1 2/20/93 16.02 2.07 H 80.37 T 7.5% 60.0% 0.68 U 0.24 U 0.12 U 0.07 U 5. 16 833AGO3 1 2/20/93 16.02 2.07 H 80.37 T 1.08 U 0.24 U 0.12 U 0.07 U 5. 16 83ADO3 1 2/20/93 16.02 2.07 H 80.37 T 0.08 U 0.24 U 0.12 U 0.07 U 5. 16 64APO3 1 2/20/93 16.01 80.37 T 0.08 U 0.24 U 0.12 U 0.00 U 5. 2 664PO01 1 2/20/93 16.70 80.37 T 0.08 U 0.22 U 0.01 U 0.00 U 5. 2 664PO03 1 2/20/93 16.70 80.38 U 80.38 S 50.38 U 0.22 U 0.01 U 0.00 U <td>676WES-</td> <td>11 633AP03</td> <td>-</td> <td>12/20/93</td> <td>14.88</td> <td>21.91</td> <td>85.12</td> <td>71.5%</td> <td>56.0%</td> <td>0.72.0</td> <td>0.25</td> <td>0.120</td> <td></td> <td>0.09</td> | 676WES- | 11 633AP03 | - | 12/20/93 | 14.88 | 21.91 | 85.12 | 71.5% | 56.0% | 0.72.0 | 0.25 | 0.120 | | 0.09 |
| S. 1863AG01 1 12/20/93 14.77 31.15 85.23 80.0% 60.2% 0.46 U 0.16 U 0.05 U 5. 1863AG02 1 12/20/93 14.75 19.64 88.25 69.7% 53.2% 0.73 U 0.26 U 0.12 U 0.05 U 5. 1863AG02 1 12/20/93 16.02 20.79 88.21 71.9% 54.0% 0.69 U 0.24 U 0.12 U 0.07 U 5. 1863ABD03 1 12/20/93 15.12 24.22 84.88 73.1% 54.4% 0.59 U 0.24 U 0.12 U 0.07 U 5. 1863ABD03 1 12/20/93 15.12 24.22 84.88 73.1% 54.4% 0.59 U 0.24 U 0.12 U 0.07 U 5. 1966AAD03 1 12/20/93 15.32 2.93 80.97 70.9% 55.4% 0.59 U 0.24 U 0.12 U 0.07 U 5. 2 664PD04 1 12/20/93 16.31 2.07 83.96 67.2% 55.3% 0.58 U 0.22 U 0.07 U 0.00 U | 676WES- | 12 633AP05 | - | 12/20/93 | 15.47 | 22.02 | 84.53 | 75.3% | 60.5% | 0.65 U | 0.23.0 | 2.5 | 0.07 | 0.08 0 |
| 5. 14 633AG02 1 12/20/93 11,75 19,64 88.25 69,7% 53.2% 0.73 U 0.26 U 0.72 U 0.00 U 5. 16 633PD03 1 12/20/93 16.09 20.79 3.60 % 0.69 U 0.24 U 0.12 U 0.07 U 0.12 U 0.07 U 5. 16 633PD04 1 12/20/93 16.09 20.79 3.1% 54.0% 0.69 U 0.24 U 0.12 U 0.07 U 0.00 U 0.12 U 0.00 U 0.12 U | 676WES- | 13 633AG01 | _ | 12/20/93 | 14.77 | 31.15 | 85,23 | 80.08 | 60.2% | 0.46 11 | | 2 80 0 | | 00.0 |
| 15.5384033 1 12/20/93 9.68 21.00 90.32 77.5% 56.0% 0.69 U 0.24 U 0.12 U 0.07 U 12/30/93 15.12 24.22 B 33.91 71.9% 54.0% 0.69 U 0.24 U 0.12 U 0.07 U 12/20/93 15.12 24.22 B 3.91 71.9% 54.0% 0.69 U 0.24 U 0.12 U 0.07 U 12/20/93 15.12 24.22 B 4.04 B 73.1% 54.4% 0.59 U 0.24 U 0.10 U 0.00 U 0.00 U 12/20/93 15.20 15.90 B 13.65 B 10.0 B 17.2 M 12/20/93 16.31 24.71 B 3.69 G 7.2% 53.3% 0.58 U 0.24 U 0.12 U 0.08 U 0.24 U 12/20/93 18.55 20.75 B 4.30 G 8.1% 57.7% 0.69 U 0.24 U 0.12 U 0.07 U 0.00 U 12/20/93 18.57 20.79 B 4.30 G 6.1% 57.7% 0.69 U 0.24 U 0.12 U 0.07 U 0.24 U 0.12 U 0.07 U 0.24 G 4.20 U 0.12 U 0.24 U 0.12 U 0.07 U 0.24 G 4.20 U 0.12 U 0.07 U 0.24 U 0.12 U 0.07 U 0.24 U 0.12 U 0.07 U 0.24 U 0.12 U 0.12 U 0.07 U 0.24 U 0.12 U 0.12 U 0.07 U 0.24 U 0.12 U 0.1 | 676WES- | 14 633AG02 | - | 12/20/93 | 11.75 | 19.64 | 88.25 | 69.7% | 53.2% | 0.73 U | | 0.12 O | | |
| 5. 16 633PD03 1 12/20/93 16.09 20.79 83.91 71.9% 54.0% 0.69 U 0.24 U 0.12 U 0.00 U 0.00 U 0.10 U 0.00 U 0.10 U 0.00 U 0.10 U 0.10 U 0.00 U 0.10 U 0.1 | 676WES- | 15 633AG03 | - . | 12/20/93 | 9.68 | 21.00 | 90.32 | 77.5% | 26.0% | 0.69 U | | 0.12 U | | 0.09 U |
| 1 12/20/93 15,12 24,22 84,88 73.1% 54.4% 0.59 U 0.21 U 0.10 U 0.06 U 0.0 | 676WES- | 16 633PD01 | | 12/20/93 | 16.09 | 20.79 | 83.91 | 71.9% | 54.0% | 0.69 U | | 0.12 U | | 0.09 U |
| 12/20/93 15.96 19.65 84.04 81.5% 61.7% 0.73 U 0.26 U 0.12 U 0.08 U 1/2/20/93 15.96 19.65 84.04 81.5% 61.7% 0.73 U 0.26 U 0.12 U 0.08 U 1/2/20/93 19.03 20.93 80.97 70.9% 55.4% 37.6 0.24 U 0.20 2.35 12/20/93 18.55 20.75 81.45 72.1% 58.3% 0.69 U 0.20 U 0.10 U 0.00 U 0.00 U 1/2/20/93 18.55 20.75 81.45 72.1% 58.3% 0.69 U 0.24 U 0.12 U 0.07 U 0.07 U 1/2/20/93 14.87 20.19 84.30 66.1% 57.7% 0.69 U 0.24 U 0.12 U 0.07 U 0.07 U 1/2/20/93 14.87 20.19 86.1% 57.7% 0.69 U 0.24 U 0.12 U 0.07 U 0.07 U 1/2/20/93 14.91 20.78 85.08 87.1% 54.0% 0.63 U 0.24 U 0.12 U 0.07 U 0.07 U 1/2/20/93 14.91 20.78 85.08 87.1% 60.0% 0.63 U 0.24 U 0.12 U 0.07 U 0.07 U 0.25 U 0.11 U 0.07 U 0.07 U 0.25 U 0.11 U 0.07 U | STEWES- | 17 633PD03 | | 12/20/93 | 15.12 | 24.22 | 84.88 | 73.1% | 54.4% | | | 0.10 U | | 0.07 U |
| 22 664PD01 1 2/20/93 19.03 20.93 80.97 70.9% 55.4% 37.6 0.24 U 2.02 2.35 2.15 2.2664PD01 1 2/20/93 15.70 20.99 84.30 66.1% 57.7% 0.69 U 0.24 U 0.12 U 0.07 U 0.07 U 12/20/93 15.70 20.99 84.30 66.1% 57.7% 0.69 U 0.24 U 0.12 U 0.07 U 0.07 U 12/20/93 15.70 20.99 84.30 66.1% 57.7% 0.69 U 0.24 U 0.12 U 0.07 U 0.07 U 12/20/93 14.87 20.19 85.09 63.3% 0.75 U 0.25 U 0.12 U 0.07 U 0.07 U 0.07 U 12/20/93 14.87 20.19 85.09 63.4% 53.8% 0.69 U 0.24 U 0.12 U 0.07 U 0.0 | 676WES- | 10 033PD04 | | 12/20/93 | 15.96 | 19.65 | 84.04 | 81.5% | 61.7% | | | 0.12 U | | |
| 22 664PD01 12/20/93 16.31 24.71 83.69 67.2% 53.3% 0.58 U 0.20 U 0.10 U 0.06 U 0.22 U 0.12 U 0.07 U 12/20/93 16.31 24.71 83.69 67.2% 53.3% 0.58 U 0.24 U 0.12 U 0.07 U 0.07 U 12/20/93 15.70 20.99 84.30 85.3% 53.9% 0.59 U 0.24 U 0.12 U 0.07 U 0.07 U 12/20/93 15.70 20.99 84.30 85.3% 53.9% 0.59 U 0.22 U 0.12 U 0.07 U 0.07 U 0.22 U 0.12 U 0.07 U 0.07 U 0.22 U 0.12 U 0.07 U 0.07 U 0.07 U 0.02 U 0.12 U 0.07 U 0.0 | 676WES- | 19 55HAP01 | - , | 12/20/93 | 19.03 | 20.93 | 80.97 | %6.02 | 55.4% | 37.6 | | 2.02 | 2.35 | 5.95 |
| 2.2 664PD01 1 12/20/93 16:35 20.75 16:35 81.3% 0.69 U 0.24 U 0.12 U 0.07 U 1/2/20/93 15:32 20.75 16:38 85.3% 0.69 U 0.24 U 0.12 U 0.07 U 0.12 U 0.07 U 1/2/20/93 15:32 22.97 86.68 67.1% 57.7% 0.69 U 0.22 U 0.12 U 0.07 U 0.07 U 0.25 U 0.12 U 0.07 U 0.07 U 0.25 U 0.12 U 0.07 U 0.07 U 0.07 U 0.25 U 0.12 U 0.07 U 0.07 U 0.07 U 0.25 U 0.14 U 0.07 U | 676WES- | 21 664AP04 | - - | 12/20/93 | 16.31 | 24.71 | 83.69 | 67.2% | 53.3% | 0.58 U | | 0.10 U | | 0.07 U |
| 5. 23 664PD03 12/20/93 14.87 20.19 65.13 69.3% 53.9% 0.72 U 0.22 U 0.12 U 0.07 U 0.08 U 12/20/93 14.87 20.19 65.13 69.3% 53.9% 0.69 U 0.22 U 0.11 U 0.07 U 0.07 U 12/20/93 14.87 20.19 65.13 69.3% 53.9% 0.69 U 0.22 U 0.11 U 0.07 U 0.07 U 12/20/93 14.91 20.78 85.09 69.4% 53.8% 0.69 U 0.22 U 0.11 U 0.07 U 0.07 U 12/20/93 17.72 22.27 82.28 71.9% 57.1% 0.63 U 0.22 U 0.11 U 0.07 U 0.07 U 12/20/93 17.72 22.27 82.28 71.9% 57.1% 0.63 U 0.22 U 0.11 U 0.07 U 0.07 U 12/20/93 17.72 22.27 82.89 70.3% 55.0% 0.69 U 0.22 U 0.11 U 0.07 U 0.07 U 12/20/93 17.73 22.47 89.59 70.3% 55.8% 0.69 U 0.22 U 0.11 U 0.07 U 0.07 U 12/20/93 17.43 22.46 82.57 73.6% 60.0% 0.65 U 0.22 U 0.11 U 0.07 U 0.07 U 12/20/93 17.43 22.46 82.57 73.6% 60.0% 0.65 U 0.22 U 0.11 U 0.07 U 0.05 U 12/20/93 12.84 17.38 87.16 67.6% 53.3% 0.89 U 0.31 U 0.15 U 0.09 U 12/20/93 13.02 16.24 86.98 64.5% 53.0% 0.89 U 0.31 U 0.15 U 0.09 U 12/20/93 14.16 14.24 85.84 73.4% 60.4% 1.01 U 0.35 U 0.17 U 0.09 U 12/20/93 14.16 14.24 85.84 73.4% 60.4% 1.01 U 0.25 U 0.12 U 0.08 U 12/20/93 14.16 14.24 85.87 66.7% 57.5% 0.72 U 0.25 U 0.12 U 0.08 U 12/20/93 14.16 14.24 85.87 66.7% 57.5% 0.72 U 0.25 U 0.12 U 0.08 U 1 12/20/93 14.16 14.24 85.87 66.7% 57.5% 0.72 U 0.25 U 0.12 U 0.08 U 1 12/20/93 14.16 14.24 85.87 66.7% 57.5% 0.72 U 0.25 U 0.12 U 0.08 U 0.12 U 0.08 U 0.12 U 0.25 U 0.12 U 0.08 U 0.12 U 0.12 U 0.13 U 0.1 | 676WES- | 22 664PD01 | | 19/20/93 | 15 70 | 20.73 | 04.19 | %1.27 | 58.3% | 0.69.0 | | 0.12 U | | |
| 25 345AP01 12/20/93 13.32 22.97 66.68 67.1% 54.0% 0.65 U 0.25 U 0.12 U 0.08 U 0.07 U 0 | 676WES- | 23 664PD03 | | 12/20/93 | 14.87 | 20.33 | 04.30 | 60.1% | 57.7% | 0.69 U | | 0.12 U | | 0.09 U |
| 25 345APO1 1 12/20/93 14.91 20.78 85.09 97.1% 93.0% 0.52 U 0.12 U 0.07 U | 676WES- | 24 664PD05 | - | 12/20/93 | 13 30 | 20.02 | 00.00 | 67.579 | %5.50 8.00 8.00 8.00 8.00 8.00 8.00 8.00 | | | 0.12 U | | 0.09 |
| 2 6 345APO5 1 12/20/93 16.95 19.65 83.05 70.3% 50.0% 0.73 U 0.22 U 0.11 U 0.00 | 676WES- | 25 345AP01 | _ | 12/20/93 | 14.91 | 20.78 | 85.09 | 60.4% | 53.0% | | | | | 0.08 U |
| 27 345AP06 1 12/20/93 17.72 22.27 82.28 71.9% 57.1% 0.63 U 0.22 U 0.11 U 0.07 U 0.28 U 0.12 U 0.12 U 0.12 U 0.07 U 0.08 U 0.29 U 0.11 U 0.07 U 0.07 U 0.09 U 0.12 U 0.12 U 0.12 U 0.07 U 0.07 U 0.07 U 0.09 U 0.12 U 0.12 U 0.07 U 0.07 U 0.07 U 0.09 U 0.24 U 0.12 U 0.07 U 0.07 U 0.07 U 0.09 U 0.09 U 0.24 U 0.25 U 0.25 U 0.15 U 0.07 U 0.07 U 0.07 U 0.09 U | 676WES- | 26 345AP05 | - | 12/20/93 | 16.95 | 19.65 | 83.05 | 70.3% | 55.0% | | | | | 0.09 0 |
| 28 345PD01 1 12/20/93 17.43 22.46 82.57 73.6% 60.0% 0.65 U 0.23 U 0.11 U 0.07 U 0.22 U 0.12 U 0.07 U 0.22 U 0.12 U 0.07 U 0.22 U 0.12 U 0.07 U 0.07 U 0.02 U 0.22 U 0.12 U 0.07 U 0.02 U 0.22 U 0.12 U 0.07 U 0.02 U 0.22 U 0.12 U 0.07 U 0.02 U | 676WES- | 27 345AP06 | - | 12/20/93 | 17.72 | 22.27 | 82.28 | 71.9% | 57.1% | 0.63 U | | | | 0.09 |
| 29 345PD03 1 12/20/93 13.71 20.89 86.29 70.3% 55.8% 0.69 U 0.24 U 0.12 U 0.07 U 0.07 U 0.3 | 676WES- | 28 345PD01 | - | 12/20/93 | 17.43 | 22.46 | 82.57 | 73.6% | %0.09 | 0.65 U | | | | 00.0 |
| 3 3 4 5 P D 4 1 12/20/93 16.02 23.47 83.98 70.4% 60.1% 0.62 U 0.22 U 0.10 U 0.05 U 0.0 | 676WES- | 29 345PD03 | - | 12/20/93 | 13.71 | 20.89 | 86.29 | 70.3% | 55.8% | | 0.24 U | | | |
| 313450P01 1 12/20/93 12.84 17.38 87.16 67.6% 53.3% 0.84 U 0.29 U 0.14 U 0.09 U 0.15 U 0.15 U 0.15 U 0.10 U 0.11 U 0.14 U 0.15 U 0.09 U 0.11 U 0.08 U 0.14 U 0.09 U 0.15 U 0.15 U 0.09 U 0.09 U 0.15 U 0.09 U 0.09 U U 0.09 U 0.09 U U 0.09 U 0.09 U 0.09 U U 0.09 U 0.09 U U 0.09 U | 676WES- | 30 345PD04 | - | 12/20/93 | 16.02 | 23.47 | 83.98 | 70.4% | 60.1% | | | | | |
| 32 3450P02 1 12/20/93 13.02 16.24 86.98 64.5% 53.0% 0.89 U 0.31 U 0.15 U 0.09 U 0.33 3450P03 1 12/20/93 14.16 14.24 85.84 73.4% 60.4% 1.01 U 0.35 U 0.17 U 0.11 U 0.11 U 0.15 U 0.12 U 0.11 U 0.11 U 0.11 U 0.11 U 0.12 U 0.12 U 0.12 U 0.08 U 1.2/20/93 14.03 19.82 85.97 66.7% 57.5% 0.72 U 0.25 U 0.12 U 0.08 U 1 12/20/93 NA NA R2.1% 68.4% 0.72 U 0.25 U 0.12 U 0.08 U 1 12/20/93 NA NA NA R2.1% 57.4% 0.72 U 0.25 U 0.12 U 0.08 U | 676WES- | 31 345QP01 | - | 12/20/93 | 12.84 | 17.38 | 87.16 | 84.6% | 53.3% | | | | | |
| 33 3450P03 1 12/20/93 14.16 14.24 85.84 73.4% 60.4% 1.01 U 0.35 U 0.17 U 0.11 U 0.12 U 0.12 U 0.12 U 0.08 U 1.2/20/93 14.03 19.82 85.97 66.7% 57.5% 0.72 U 0.25 U 0.12 U 0.08 U 1 12/20/93 NA NA R2.1% 68.4% 0.72 U 0.25 U 0.12 U 0.08 U 1 12/20/93 NA NA NA R2.1% 57.4% 0.72 U 0.25 U 0.12 U 0.08 U | 676WES- | 32 345QP02 | - | 12/20/93 | 13.02 | 16.24 | 86.98 | 64.5% | 53.0% | | | | | |
| 34 140/150AP01 1 12/20/93 15.55 19.91 84.45 66.0% 54.9% 0.72 U 0.25 U 0.12 U 0.08 U 12/20/93 14.03 19.82 85.97 66.7% 57.5% 0.72 U 0.25 U 0.12 U 0.08 U 12/20/93 NA NA 62.1% 68.4% 0.72 U 0.25 U 0.12 U 0.08 U 12/20/93 NA NA NA 62.1% 57.4% 0.72 U 0.25 U 0.12 U 0.08 U | 676WES- | 33 345QP03 | - | 12/20/93 | 14.16 | 14.24 | 85.84 | 73.4% | 60.4% | | | | | |
| 35 140/150AP02 1 12/20/93 14.03 19.82 85.97 66.7% 57.5% 0.72 U 0.25 U 0.12 U 0.08 U 1 12/20/93 NA NA 62.1% 68.4% 0.72 U 0.25 U 0.12 U 0.08 U 1 12/20/93 NA NA RELINGUE 57.4% 0.72 U 0.25 U 0.12 U 0.08 U | 676WES- | 34 140/150AP01 | - | 12/20/93 | 15.55 | 19.91 | 84.45 | %0.99 | 54.9% | | | | | |
| 1 12/20/93 NA NA 62.1% 68.4% 0.72 U 0.25 U 0.12 U 0.08 U 1 12/20/93 NA NA NA 62.1% 57.4% 0.72 U 0.25 U 0.12 U 0.08 U | 676WES- | 35 140/150AP02 | - | 12/20/93 | 14.03 | 19.82 | 85.97 | 66.7% | 57.5% | | 9 6 | | | 0.00 |
| 1 12/20/93 NA NA NA 62.1% 68.4% 0.72 U 0.25 U 0.12 U 0.08 U 1 12/20/93 NA NA NA 62.1% 57.4% 0.72 H 0.35 H 0.43 H | Disab. | | , | | : | ; | | | | | | | | 0.03 |
| 1 12/20/93 NA NA 62.1% 57.4% 0.79.11 0.35.11 0.49.11 | Diant. | | | 12/20/93 | Z | ¥ | A A | 62.1% | 68.4% | 0.72 U | | | | 0.09 |
| 0.00 0.21.0 0.22.0 0.10 | DIBIN-2 | | - | 12/20/93 | ¥ Z | Š | Y Y | 62.1% | 57.4% | 0.72 U | | | | 0.09 U |

| Concentrations in µg/kg wet wt.) HEXA- HEXA- O-LOAD NS NS 2.50 NS NS 1.93 NS NS 1.93 NS NS 1.93 NS NS 2.50 NS NS 2.01 NS NS 2.02 NS NS NS 2.02 |
|---|
|---|

| | PESTICIDES IN MUSSEL TISSUE SAMPLES BATCH 1 | MPLES | ی | concentration | (concentrations in µg/kg wet wt.) | wet wf.) | | | | | |
|------------|--|------------|-----------------|---------------|-----------------------------------|-----------------------|----------|---------------------|------------------|------------------|--------|
| MSL Code | Sponsor ID | Batch | Extract Date | PBHC | D-BHC | HEPTACHLOR EPOXIDE | 2,4'-DDE | ENDO- g SULFAN I | g-CHLOR- DANE | a-CHLOR- DANE | TRANS |
| | 1 622AP01 | - | 12/20/93 | 0.24 U | 0.24 U | 0.23 U | 0.06 U | 0.24 U | 1.06 | 0.58 | 28.5 |
| | 2 622AP03 | - | 12/20/93 | | | | | | 1.13 | 0.71 | 90 |
| | 3 622AP06 | - | 12/20/93 | | | 0.51 | | | 0.95 | 0.57 | 0.06 U |
| | 4 622PD01 | _ | 12/20/93 | | | 0.62 | | | 1.46 | 0.88 | |
| 6/6WES- | 5 622PD03 | , . | 12/20/93 | | | 0.64 | | | 1.65 | 1.03 | 0.06 U |
| | 6 622PD05 | | 12/20/93 | 0.25 U | 0.25 U | 0.64 | 0.07 U | | 1.40 | 0.90 | 90 |
| | | - - | 12/20/93 | | | | | 0.26 0 | 0.87 | 0.48 | 56 |
| | 9 622QP03 | - | 12/20/93 | | | 0.20 | 0.07 | 0.27 0 | 01.1 | 0.42 | 0.07 U |
| | 10 633AP02 | - | 12/20/93 | 0.25 U | | 0.0 | | | 0.89 | 0.0 | 0.34 |
| 676WES- 1 | 11 633AP03 | - | 12/20/93 | | | 0.53 | | | 0.00 | 92.0 | 0 90.0 |
| 676WES- 12 | 12 633AP05 | - | 12/20/93 | 0.23 U | | 0.53 | 0.06 U | 200 | 50.5 | 0.00 | 0 00.0 |
| - | 3 633AG01 | - | 12/20/93 | | | 0.16 U | | 0.16 U | 0.58 | 0.34 | 0.04 U |
| _ | 4 633AG02 | - | 12/20/93 | | | 0.48 | | 0.26 U | 0.71 | 0.40 | 0.06 U |
| 676WES- 15 | 5 633AG03 | | 12/20/93 | | | 0.24 U | | 0.24 U | 0.62 | 0.36 | |
| | 16 6337001 | | 12/20/93 | | | 0.52 | 0.07 U | | 0.81 | 0.45 | |
| | 17 633PD03 | - • | 12/20/93 | | | 0.47 | | | 0.92 | 0.44 | 0.27 |
| | 18 553PD04 | - , | 12/20/93 | 0.26 U | | | 0.07 U | 28 | | | 0.29 |
| | 19 CONAPOI | | 12/20/93 | 0.24 U | | 0.24 U | 0.07 U | | 0.24 U | | |
| | 21 664AP04 | | 12/20/93 | | 0.20 | 0.47 | 0.05 U | 0.20 0 | 2.19 | 0.75 | 0.05 U |
| | 22 664PD01 | - | 12/20/93 | | | 0.24 U | | | 0.00 | 0.30 | |
| | 23 664PD03 | _ | 12/20/93 | 0.25 U | 0.25 U | | | | 0.54 | 0.36 | 0.06 U |
| | 24 664PD05 | - | 12/20/93 | | | 0.46 | | 0.23 | 0.63 | 0.48 | 0.05 U |
| | 345AP01 | - | 12/20/93 | | | 0.24 U | 0.07 U | | 1.06 | 0.57 | 0.29 |
| 676WES- 26 | 26 345AP05 | - | 12/20/93 | | | 0.25 U | 0.07 U | | 0.26 U | | 0.06 U |
| | 27 345APU6 | | 12/20/93 | | | | | 0.22 U | 0.72 | 0.40 | 0.05 U |
| | 20 3450000 | - • | 12/20/93 | 0.23 0 | 23 | 22 | | 0.23 | 1.23 | 0.57 | 0.28 |
| | 30 245 003 | - • | 12/20/93 | | 4 6 | 24 | | 0.31 | 1.24 | 0.65 | 0.34 |
| | 31 3450001 | - • | 12/20/93 | | 7 6 | 5 5 | | | | | |
| | 040000 | | 10/00/00 | | 5 | 0.28 0 | | | | | 0.07 U |
| | 32 3450,00 | - , | 12/20/93 | | 31 | 67 | | 6 | 0.31 U | | 0.08 U |
| | 345GP03 | | 12/20/93 | | 32 | 34 | | 0.35 U | | | 0.08 U |
| | 34 14U/15UAP01 | _ | 12/20/93 | 25 | ည | | | 0.43 | 0.58 | 0.71 | 0.08 U |
| 676WES- 35 | 35 140/150AP02 | - | 12/20/93 | 0.25 U | 0.25 U | 0.24 U | 0.07 U | 0.35 | 0.50 | 0.62 | |
| Blank-1 | | - | 12/20/93 | | 0.25 U | | 11 20 0 | 11 30 0 | 200 | 0 | 0 |
| Blank-2 | | - | 12/20/93 | 0.25 U | | 0.24 11 | 0.00 | 0.25.0 | 0.63.0 | 0.000 | 0.000 |
| | | | | | 1 | | | 3 | | 0.00 | 0.00 |

| Big Barch Batch Date | | |
|---|--|--------------------|
| 1 12/20/93 NS | ENDO GCHLOR- &CHLOR- SULFAN DANE DANE N | TRANS NONACHLOR |
| 1 12/20/93 NS | | |
| JLTS AAPO3 | 9V 9 | 2 2 |
| APO3 1 12/20/93 NS | 2 2 | 2 2 |
| APO3 1 12/20/93 NS | 2 | 2 |
| AAPO3 1 12/20/93 NS | 9 | 2 |
| JLTS JLTS AAPO3 | 92 | 2 |
| JLTS JLTS AAPO3 1 12/20/93 NS | SN SN SN | 2 |
| APO3 1 12/20/93 NS | S | 2 |
| FRESULTS THESULTS THESUL | 2 | 2 |
| HESULTS Ind Ind Ind Ind Ind Ind Ind In | 2 | 2 |
| A Spike 1 12/20/93 NS | | |
| 633AP03 1 12/20/93 NS NS NS NS NS NS Spike 1 1 12/20/93 NS | 92 | 92 |
| Spike 1 1 12/20/93 NS | S | 92 |
| 8 8 <td>SN SN SN</td> <td>9</td> | SN SN SN | 9 |
| * * * * * * * * * * * * * * * * * * * | 2 | 2 |
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| & & & & & & & & & & & & & & & & & & & | SN SN | 92 |
| 8 8 8 8 8 8 8 8 8 | 92 | 92 |
| 25 25 25 25 25 25 26 25 27 25 | 9 | 92 |
| 2 | S ₂ | 92 |
| U ≈ Not detected at or above the detection limit shown NA ≈ Not applicable. | S | 2 |
| no spiked. • = Outside QC criteria (30-150%). | | |
| # = Outside QC criteria (50-120%). | | |
| l and | | |

| Extract Extract Date 4,00E DBDRIN 2,4.0D DBCAN 2,4.0D A,4.0D SULFANII 4,0D 2 622APO3 1 12/20/93 114 2,61 6.10 0.24 U 0.21 U 65.4 1.19 3.67 2 622APO3 1 12/20/93 114 2.61 6.10 0.24 U 0.21 U 61.8 1.22 4 622PO3 1 1 12/20/93 126 3.63 9.97 0.24 U 0.21 U 61.8 1.22 4 622PO3 1 1 12/20/93 126 3.63 9.97 0.24 U 0.21 U 61.8 1.22 5 622PO3 1 1 12/20/93 126 3.63 9.97 0.22 U 0.21 U 61.8 2.14 11.7 5 622PO3 1 1 12/20/93 12.20/93 12.20/93 1.86 3.81 0.22 U 0.22 U 1.94 1.6 1.74 1.15 1.5 1.5 1.5 1.5 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1 | ВАТСН 1 | PESTICIDES IN MUSSEL TISSUE SAMPLES BATCH 1 | | (concentrations in µg/kg wet wt.) | s in μg/kg w | et wt.) | | | | | | |
|--|------------------------|--|-----------------|-----------------------------------|--------------|---------|--------|----------|----------|--------------------|----------|--------|
| 1 622AP01 1 12/20/93 114 2.61 6.10 0.24 U 0.21 U 66.6 1.19 2 622AP03 1 22/20/93 103 2.90 7.04 0.24 U 0.21 U 66.8 1.52 4 622AP03 1 22/20/93 126 3.63 9.7 0.20 U 0.21 U 66.8 1.52 5 622AP03 1 22/20/93 126 3.63 9.7 0.20 U 0.21 U 66.8 1.52 5 622P004 1 22/20/93 126 3.57 9.26 0.22 U 7.9 2.6 7 622D07 1 22/20/93 126 3.57 9.26 0.22 U 47.9 0.8 9 622D07 1 22/20/93 7.6 2.05 4.73 0.22 U 47.9 0.8 1 633AP02 1 22/20/93 7.6 2.05 0.02 U 0.22 U 45.4 0.56 1 633AP03 1 22/20/93 9.6 2.6 1.6 3.81 0.24 U 0.21 U 0.51 0.05 1 633AP03 <td< th=""><th></th><th>Batch</th><th>Extract Date</th><th></th><th>DIELDRIN</th><th>2,4DDD</th><th>ENDRIN</th><th>2,4'-DDT</th><th>4,4'-DDD</th><th>ENDO- SULFAN II</th><th>4,4'-DDT</th><th>ENDRIN</th></td<> | | Batch | Extract Date | | DIELDRIN | 2,4DDD | ENDRIN | 2,4'-DDT | 4,4'-DDD | ENDO- SULFAN II | 4,4'-DDT | ENDRIN |
| 2 862APDG 1 12/20/93 103 2.90 7.04 0.24 U 0.21 U 68.8 1.52 4 622PDG 1 12/20/93 10.3 2.90 7.04 0.21 U 61.8 1.28 5 622PDG 1 12/20/93 126 3.57 9.26 0.22 U 9.8 2.14 6 622PDG 1 12/20/93 7.2 3.65 9.26 0.22 U 79.8 2.14 7 622DPG 1 12/20/93 77.4 2.05 4.92 0.21 U 98.8 2.14 8 622DPG 1 12/20/93 77.4 2.05 4.92 0.27 U 0.23 U 4.9 0.86 1 6 633APG 1 12/20/93 65.2 1.66 3.81 0.22 U 0.22 U 9.1 0.24 0.22 U 0.24 0.25 U 0.25 0.24 0.25 U 0.24 0.25 U 0.24 0.24 0.24 0.24 0.24 0.24 0.24 0.24 0.24 0.24 0.24 0.24 0.24 0.24 0.24 0.24 | - | - | 12/20/93 | 114 | 2.61 | 6.10 | | | 65. | 1.19 | 3.67 | 0.24 |
| 3 622APO6 1 12/20/93 9 0.3 2.47 6.28 0.24 U 0.21 U 61.8 1.28 4 622PO01 1 12/20/93 126 3.63 9.97 0.25 U 0.21 U 80.5 2.02 6 622PO05 1 12/20/93 125 3.57 9.26 0.25 U 0.21 U 80.5 2.04 7 622OPO1 1 12/20/93 7.2 1.96 4.73 0.26 U 0.22 U 79.8 2.14 9 622OPO3 1 12/20/93 7.2 1.96 4.73 0.26 U 0.22 U 79.8 2.14 1 633APO2 1 12/20/93 65.2 1.66 3.81 0.22 U 79.8 2.14 1 633APO3 1 12/20/93 61.6 1.51 5.36 0.16 U 0.22 U 79.8 2.14 1 633AGO1 1 12/20/93 61.9 1.51 5.36 0.16 U 0.22 U 79.8 0.74 1 633AGO1 1 12/20/93 61.9 1.54 0.26 U 0.22 U 79.8 0.74 < | | - | 12/20/93 | 103 | 2.90 | 7.04 | | | | 1.52 | 4.35 | 0.24 |
| 4 (ASPEDDO) 1 (2/20/93) 126 3.63 9.97 0.25 U 0.21 U 90.5 2.02 6 622PD03 1 (2/20/93) 141 4.10 11.5 0.24 U 0.21 U 90.5 2.44 6 622PD03 1 (2/20/93) 77.4 2.05 6.90 0.20 U 0.22 U 7.99 0.86 7 622QP01 1 (2/20/93) 77.4 2.05 6.90 0.20 U 0.22 U 7.99 0.86 9 622QP02 1 (2/20/93) 77.4 2.05 6.90 0.20 U 0.21 U 0.90 0.86 1 (6 33AP02 1 (2/20/93) 6.5 1.66 3.81 0.20 U 0.87 1.04 1 (6 33AP02 1 (2/20/93) 6.1 2.38 6.2 0.20 U 0.87 1.04 1 (6 33AP03 1 (2/20/93) 6.1 1.51 6.36 0.20 U 0.80 U 0.87 1.04 1 (6 33AP03 1 (2/20/93) 6.1 1.51 6.20 U 0.20 U 0.87 1.04 | e. | - | 12/20/93 | 90.3 | 2.47 | 6.28 | | | | 1.28 | 3.62 | 0.24 |
| 5 622PD03 1 12/20/93 141 4.10 11.5 0.24 U 0.21 U 99.8 2.44 6 622PD05 1 12/20/93 125 3.57 9.26 0.25 U 0.22 U 79.8 2.14 7 6220P02 1 12/20/93 77.4 2.05 4.92 0.27 U 0.24 U 50.1 0.91 8 6220P02 1 12/20/93 77.4 2.05 4.92 0.27 U 0.24 U 50.1 0.91 1 6 633APO2 1 12/20/93 6.2 1.66 3.81 0.25 U 0.22 U 6.27 1.04 1 6 633APO3 1 12/20/93 6.1 1.64 2.61 7.22 0.22 U 6.27 1.04 1 6 633APO4 1 12/20/93 6.1 1.64 5.18 0.24 U 0.20 U 6.7 1.04 1 6 633PO4 1 12/20/93 8.7 1.64 5.18 0.24 U 0.21 U 0.20 0.20 0.20 0.22 U 0.22 U 0.22 U 0.22 U 0.22 U 0.22 U 0.22 U <t< td=""><td>4</td><td>-</td><td>12/20/93</td><td>126</td><td>3.63</td><td>9.97</td><td></td><td></td><td></td><td>2.02</td><td>7.04</td><td>0.25</td></t<> | 4 | - | 12/20/93 | 126 | 3.63 | 9.97 | | | | 2.02 | 7.04 | 0.25 |
| 6 SZZPPOUS 1 2/20/93 2 2/20 1 2/20/93 1 2/20/93 2 2/20 1 2/20/93 1 2/20/93 2 2/20 1 2/20/93 1 2/20 | ın ı | - | 12/20/93 | 141 | 4.10 | 11.5 | | | | 2.44 | 11.3 | 0.24 |
| 86220P02 1.2/20/93 7.0.2 1.96 4,73 0.26 U 0.23 U 44.9 0.86 9 6220P02 1 2/20/93 7.7.4 2.06 5.90 0.26 U 0.23 U 50.1 0.91 1 6 633AP02 1 2/20/93 78.4 2.26 5.90 0.26 U 0.22 U 45.4 0.56 1 6 633AP02 1 2/20/93 6.5 1.66 3.81 0.25 U 0.20 U 62.1 1.04 1 6 633AP03 1 2/20/93 91.6 2.01 7.22 0.23 U 0.20 U 62.1 1.04 1 6 633AP03 1 2/20/93 91.6 2.61 0.24 U 0.21 U 0.24 U 0.27 U 0.57 1 6 63AP004 1 2/20/93 77.9 2.08 4.43 0.21 U 0.24 U 0.21 U 0.74 1 6 63AP004 1 2/20/93 77.9 2.08 4.43 0.21 U 0.24 U 0.21 U 0.74 1 6 63AP004 1 2/20/93 77.9 2.08 4.43 0.22 U 0.24 U <td>9 1</td> <td>- •</td> <td>12/20/93</td> <td>125</td> <td>3.57</td> <td>9.26</td> <td></td> <td></td> <td></td> <td>2.14</td> <td>11.7</td> <td>0.25</td> | 9 1 | - • | 12/20/93 | 125 | 3.57 | 9.26 | | | | 2.14 | 11.7 | 0.25 |
| 9 6220003 1 12/20/93 7/3 2.05 4.92 0.27 U 0.24 U 50.1 0.91 1 0 633AP02 1 2/20/93 1 2.05 1.66 3.81 0.25 U 0.22 U 45.4 0.56 1 1 6833AP03 1 1 2/20/93 91.6 2.61 7.22 0.23 U 0.20 U 65.7 1.00 1 2 633AP03 1 1 2/20/93 91.6 2.61 7.22 0.23 U 0.20 U 65.7 1.10 1 4 633AG04 1 1 2/20/93 91.6 2.61 0.20 U 0.20 U 66.7 1.10 1 4 633AG03 1 1 2/20/93 92.6 1.64 5.18 0.24 U 0.20 U 6.77 1 6 633AG03 1 1 2/20/93 87.6 1.64 5.18 0.24 U 0.21 U 9.20 0.77 1 6 633AG03 1 1 2/20/93 87.6 1.64 5.18 0.24 U 0.21 U 9.20 0.77 1 6 63AF004 1 1 2/20/93 87.9 2.08 4.49 0.21 U 0.21 U 4.76 | - α | | 12/20/93 | 70.5 | 1.96 | 4.73 | | | | 0.86 | 1.56 | 0.26 |
| 1 633APD3 1 12/20/93 65.2 1.06 5.90 0.28 U 0.28 U 52.7 1.07 1.08 C 533APD3 1 12/20/93 83.4 2.38 6.52 0.29 U 0.20 U 62.7 1.07 1.16 633APD3 1 12/20/93 83.4 2.38 6.52 0.29 U 0.20 U 62.7 1.10 1.10 1.20/93 92.6 1.9 1.51 5.35 0.16 U 0.20 U 62.7 1.10 1.10 1.20/93 92.6 1.9 1.51 5.35 0.16 U 0.20 U 62.7 1.10 1.10 1.20/93 92.6 1.9 1.85 6.40 0.24 U 0.21 U 50.9 0.77 1.20 0.24 U 0.21 U 0.21 U 50.9 0.77 1.20 0.24 U 0.21 U 0.21 U 50.9 0.77 1.20 0.24 U 0.21 U 0.21 U 50.9 0.77 1.20 0.24 U 0.21 U 0.22 U 5.20 0.24 U 0.22 U 0.24 U 0.22 U 5.20 0.24 U 0.22 U 0.24 U 0.22 U 5.20 0.24 U 0.22 U 0.24 U 0.22 U 5.20 0.24 U 0.22 U 0.24 U 0.25 U 0.24 U 0.22 U 0.24 U 0.25 U 0 | 0 | | 12/20/93 | 4.17 | 2.05 | 4.92 | 0.27 U | | | 0.91 | 1.65 | 0.27 |
| 11 633AP03 12/20/93 9.1.6 2.38 2.39 0.23 U 0.20 U 62.1 1.04 12 633AP05 12/20/93 91.6 2.61 7.22 0.23 U 0.20 U 62.1 1.04 13 633AG01 12/20/93 91.6 2.61 7.22 0.23 U 0.20 U 66.7 1.04 14 633AG02 12/20/93 92.6 1.85 6.40 0.26 U 0.20 U 66.7 1.04 15 633AG03 12/20/93 77.2 1.86 3.83 0.24 U 0.21 U 47.6 0.77 16 633AG03 12/20/93 77.9 2.08 4.43 0.21 U 0.21 U 47.6 0.70 16 633AG03 12/20/93 77.9 2.08 4.43 0.21 U 47.6 0.70 16 633AG03 12/20/93 77.9 2.08 4.43 0.21 U 47.6 0.70 17 633PD04 12/20/93 77.9 2.08 4.43 0.21 U 47.6 0.70 20 664AP03 | - | - | 12/20/93 | , o. o. | 2.20 | 0.90 | 0.26 0 | | | 1.07 | 1.97 | 0.26 |
| 12 633AP05 1 2/20/93 91.6 2.61 7.22 0.23 U 0.20 U 66.7 1.10 13 633AG01 1 2/20/93 61.9 1.51 5.35 0.16 U 0.14 U 39.3 0.67 14 633AG02 1 2/20/93 92.6 1.64 5.35 0.16 U 0.14 U 39.3 0.67 15 633PD01 1 2/20/93 77.9 2.08 4.43 0.24 U 0.21 U 47.6 0.77 17 633PD03 1 2/20/93 77.9 2.08 4.43 0.21 U 0.21 U 47.6 0.77 18 633PD04 1 2/20/93 76.9 2.07 4.49 0.22 U 0.21 U 47.6 0.77 18 633PD04 1 2/20/93 76.9 2.07 4.49 0.22 U 0.21 U 47.6 0.77 18 633PD04 1 2/20/93 76.9 2.07 4.49 0.22 U 0.21 U 47.6 0.77 20 664AP04 1 2/20/93 102 2.75 6.89 0.24 U 0.21 U <td< td=""><td></td><td>-</td><td>12/20/93</td><td>83.2</td><td>38</td><td>2.0.0</td><td></td><td>0.88.0</td><td></td><td>0.50</td><td>0.73</td><td>0.25</td></td<> | | - | 12/20/93 | 83.2 | 38 | 2.0.0 | | 0.88.0 | | 0.50 | 0.73 | 0.25 |
| 13 633AG01 1 2/20/93 61.9 1.51 5.35 0.16 U 0.22 U 53.9 0.57 14 633AG02 1 2/20/93 92.6 1.85 6.40 0.26 U 0.22 U 53.8 0.74 15 633AD01 1 2/20/93 77.2 1.86 3.83 0.24 U 0.21 U 47.6 0.77 17 633PD03 1 2/20/93 77.9 2.08 4.49 0.21 U 0.21 U 47.6 0.77 18 633PD04 1 2/20/93 76.9 2.07 4.49 0.21 U 0.21 U 47.6 0.77 18 633PD04 1 2/20/93 76.9 2.07 4.49 0.22 U 0.21 U 47.6 0.77 18 63APD03 1 2/20/93 80.0 10.8 6.40 0.22 U 0.21 U 50.2 1.79 21 66APD04 1 2/20/93 65.8 2.02 4.49 0.22 U 0.18 U 47.8 0.74 22 66APD03 1 2/20/93 65.8 2.02 2.02 0.20 U 0.18 U <t< td=""><td>676WES- 12 633AP05</td><td>-</td><td>12/20/93</td><td>91.6</td><td>2.61</td><td>7.22</td><td>0.23.0</td><td>0.500</td><td></td><td>‡ C</td><td>0 00 0</td><td>20.0</td></t<> | 676WES- 12 633AP05 | - | 12/20/93 | 91.6 | 2.61 | 7.22 | 0.23.0 | 0.500 | | ‡ C | 0 00 0 | 20.0 |
| 14 633AG02 1 12/20/93 92.6 1.85 6.40 0.26 U 0.22 U 53.8 0.74 15 633AG03 1 12/20/93 17.2 1.64 5.18 0.24 U 0.21 U 50.9 0.77 17 633AD03 1 12/20/93 77.9 2.08 4.49 0.21 U 0.21 U 47.6 0.77 18 633AD03 1 12/20/93 76.9 2.07 4.49 0.21 U 0.21 U 47.6 0.77 18 63APD04 1 12/20/93 76.9 2.07 4.49 0.22 U 0.22 U 50.2 1.00 20 664AP03 1 2/20/93 102 2.75 6.89 0.24 U 0.21 U 50.7 1.74 21 664P04 1 12/20/93 102 2.75 6.89 0.24 U 0.21 U 40.9 0.75 22 664P03 1 12/20/93 65.8 2.02 3.98 0.24 U 0.21 U 47.8 0.79 23 664P03 1 12/20/93 65.8 2.02 2.02 0.25 U 0.19 U | <u>.</u> | - | 12/20/93 | 61.9 | 1.51 | 5.35 | 0.1611 | | | 0.10 | 1 20 | 0.45 |
| 15 633AG03 1 12/20/93 87.6 1.64 ··· 5.18 0.24 U 0.21 U 50.9 0.77 16 633PD01 1 12/20/93 77.9 2.08 4.43 0.21 U 0.21 U 47.6 0.77 18 633PD04 1 12/20/93 77.9 2.08 4.43 0.21 U 0.21 U 47.6 0.77 19 66RAP01 1 2/20/93 76.9 2.07 4.49 0.24 U 0.21 U 47.6 0.74 20 664AP03 1 2/20/93 178 5.44 14.0 0.20 U 0.18 U 112 1.79 20 664AP03 1 2/20/93 102 2.75 6.89 0.24 U 0.21 U 50.7 1.79 21 664P04 1 12/20/93 65.8 2.02 3.98 0.24 U 0.21 U 40.9 0.79 22 664P003 1 12/20/93 65.8 2.02 3.98 0.22 U 0.18 U 47.8 0.79 24 664P005 1 12/20/93 65.3 1.82 3.73 0.22 U 0.19 U | | - | 12/20/93 | 92.6 | 1.85 | 6.40 | | | | 0.74 | 3.1 | 0.26 |
| 16 633PD01 1 12/20/93 71.2 1.86 3.83 0.24 U 0.21 U 47.6 0.77 17 633PD03 1 2/20/93 77.9 2.08 4.43 0.21 U 0.18 U 52.0 1.00 18 68RAP01 1 2/20/93 76.9 2.08 4.43 0.24 U 0.22 U 53.2 1.01 20 664AP03 1 2/20/93 178 5.44 14.0 0.24 U 0.21 U 59.7 0.24 U 20 664AP03 1 2/20/93 102 2.75 6.89 0.24 U 0.21 U 70.6 0.74 21 664AP04 1 2/20/93 102 2.75 6.89 0.24 U 0.21 U 70.6 0.74 22 664P001 1 2/20/93 62.3 1.82 3.73 0.22 U 0.19 U 47.8 0.79 24 664P003 1 2/20/93 62.3 1.82 3.73 0.22 U 0.19 U 47.8 0.74 25 345AP05 1 2/20/93 50.3 1.30 2.52 0.26 U 0.19 U <t< td=""><td></td><td>-</td><td>12/20/93</td><td>9.78</td><td>1.64</td><td>5.18</td><td></td><td></td><td></td><td>0.70</td><td>0.71</td><td>0.24</td></t<> | | - | 12/20/93 | 9.78 | 1.64 | 5.18 | | | | 0.70 | 0.71 | 0.24 |
| 17 633PD03 1 12/20/93 77.9 2.08 4.43 0.21U 0.18 U 52.0 1.00 1.00 1.8 d 633PD04 1 12/20/93 76.9 2.07 4.49 0.26 U 0.22 U 53.2 1.01 19 668AP01 1 12/20/93 76.9 2.07 4.49 0.26 U 0.22 U 53.2 1.01 2.06 d 4.03 1.22 U 53.2 1.01 2.00 1.00 1.00 0.24 U 0.21 U 59.7 0.24 U 0.24 U 0.21 U 59.7 0.24 U 1.22 U 54.0 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1 | | . | 12/20/93 | 71.2 | 1.86 | 3.83 | | 0.21 U | | 0.77 | 1,10 | 0.24 |
| 18 634P004 1 12/20/93 76.9 2.07 4.49 0.26 U 0.22 U 53.2 1.01 1.01 1.2/20/93 80.0 10.8 6.40 0.24 U 0.21 U 59.7 0.24 U 1.2/2 U 59.7 0.24 U 0.21 U 59.7 0.24 U 1.2/2 U 59.7 0.24 U 0.21 U 59.7 0.24 U 0.21 U 59.7 0.24 U 0.21 U 2/2 U 59.3 1.02 2.02 3.98 0.24 U 0.21 U 49.9 0.79 2.3 664P001 1 12/2 U/93 62.3 1.82 3.56 0.25 U 0.21 U 49.9 0.79 2.3 664P005 1 12/2 U/93 62.3 1.82 3.56 0.25 U 0.21 U 49.9 0.79 2.3 464P005 1 12/2 U/93 57.3 1.88 3.73 0.22 U 0.19 U 46.5 0.74 2.5 345AP01 1 12/2 U/93 50.3 1.30 2.52 U 0.19 U 46.5 0.95 2.7 345AP06 1 12/2 U/93 50.3 1.30 2.52 U 0.19 U 45.8 0.64 2.8 345AP01 1 12/2 U/93 95.2 2.45 5.99 0.23 U 0.19 U 65.6 1.10 3.3 345QP01 1 12/2 U/93 66.7 1.74 3.22 0.29 U 0.19 U 69.6 1.27 3.3 345QP01 1 12/2 U/93 66.7 1.74 3.22 0.29 U 0.25 U 0.19 U 69.6 1.27 3.3 345QP01 1 12/2 U/93 67.3 1.80 3.35 0.31 U 0.25 U 3.9 0.61 3.3 3.3 3.3 3.3 3.3 3.3 3.3 3.3 3.3 3. | | - | 12/20/93 | 77.9 | 2.08 | 4.43 | | | | 1.00 | 1.74 | 0.21 |
| 19 66HAPO1 1 12/20/93 80.0 10.8 6.40 0.21 U 59.7 0.24 U 20 66AAPO3 1 12/20/93 178 5.44 14.0 0.20 U 0.18 U 112 1.79 21 66AAPO4 1 12/20/93 102 2.05 3.98 0.24 U 0.21 U 70.6 0.74 22 66APD01 1 12/20/93 62.3 1.82 3.56 0.24 U 0.21 U 47.8 0.79 23 66APD03 1 2/20/93 62.3 1.82 3.56 0.24 U 0.21 U 49.9 0.79 24 66APD05 1 2/20/93 57.3 1.88 3.73 0.22 U 0.19 U 46.5 0.74 25 345AP01 1 2/20/93 50.3 1.30 2.52 0.26 U 0.21 U 46.5 0.74 27 345AP05 1 12/20/93 50.3 1.30 2.52 0.26 U 0.19 U 45.8 0.64 29 345P001 1 12/20/93 70.3 1.67 5.90 6.95 0.22 U 0.19 U | | - | 12/20/93 | 6.92 | 2.07 | 4.49 | | | | 1.01 | | 0.26 |
| 20 664P01 1 12/20/93 178 5.44 14.0 0.20 U 0.18 U 112 1.79 1.22 664P01 1 12/20/93 65.8 2.02 3.96 0.24 U 0.21 U 70.6 0.74 2.26 64P01 1 12/20/93 65.8 2.02 3.96 0.24 U 0.21 U 70.6 0.79 2.26 64P01 1 12/20/93 65.3 1.82 3.56 0.25 U 0.19 U 46.5 0.79 2.2 345AP01 1 12/20/93 57.3 1.88 3.73 0.22 U 0.19 U 46.5 0.74 2.2 345AP01 1 12/20/93 50.3 1.30 2.52 0.26 U 0.22 U 31.9 0.43 2.2 345AP01 1 12/20/93 70.3 1.67 3.89 0.22 U 0.19 U 45.8 0.64 2.2 345AP01 1 12/20/93 70.3 1.67 3.89 0.22 U 0.19 U 45.8 0.64 3.3 3.345QP01 1 12/20/93 111 2.90 6.95 0.22 U 0.19 U 69.6 1.11 3.3 345QP01 1 12/20/93 66.7 1.74 3.22 0.29 U 0.25 U 39.0 0.61 3.3 3.3 3.3 3.3 3.3 3.3 3.3 3.3 3.3 3. | | | 12/20/93 | 80.0 | 10.8 | 6.40 | | | | 0.24 U | | 0.24 |
| 22 664PD01 1 12/20/93 65.8 2.75 6.89 0.24 U 0.21 U 70.6 0.74 22 664PD01 1 12/20/93 65.8 2.02 3.98 0.24 U 0.21 U 70.6 0.79 22 664PD03 1 12/20/93 65.3 1.88 3.73 0.22 U 0.19 U 46.5 0.79 25.45APD1 1 12/20/93 86.4 2.20 5.04 0.24 U 0.21 U 56.5 0.95 25.45APD1 1 12/20/93 50.3 1.30 2.52 0.26 U 0.22 U 31.9 0.43 2.8345APD1 1 12/20/93 70.3 1.67 3.89 0.22 U 0.19 U 45.8 0.64 2.9 345APD01 1 12/20/93 109 2.68 6.51 0.24 U 0.21 U 66.6 1.11 30 345APD03 1 12/20/93 119 2.90 6.95 0.22 U 0.19 U 69.6 1.11 3.3 345APD04 1 12/20/93 66.7 1.74 3.22 0.29 U 0.25 U 39.0 0.61 33.3 345APD02 1 12/20/93 67.3 1.80 3.35 0.31 U 0.27 U 40.3 0.61 | | | 12/20/93 | 178 | 5.44 | 14.0 | | | | 1.79 | | 0.20 |
| 23 664PD03 1 12/20/93 65.3 1.82 3.98 0.24 U 0.21 U 49.9 0.79 23 664PD03 1 12/20/93 65.3 1.82 3.56 0.25 U 0.22 U 47.8 0.58 25 454PD03 1 12/20/93 65.3 1.82 3.56 0.25 U 0.19 U 46.5 0.74 25 345AP01 1 12/20/93 88.4 2.20 5.04 0.24 U 0.21 U 56.5 0.95 26 345AP05 1 12/20/93 70.3 1.67 3.89 0.22 U 0.19 U 45.8 0.64 29 345AP01 1 12/20/93 95.2 2.45 5.99 0.22 U 0.19 U 45.8 0.64 29 345AP01 1 12/20/93 119 2.96 6.95 0.22 U 0.19 U 66.6 1.11 30 345AP01 1 12/20/93 111 2.90 6.95 0.22 U 0.19 U 69.6 1.11 32 345AP01 1 12/20/93 66.7 1.74 3.22 0.29 U 0.25 U 39.0 0.61 33 345AP01 1 12/20/93 67.3 1.80 3.35 0.31 U 0.25 U 40.3 0.61 | | - • | 12/20/93 | 102 | 2.75 | 6.89 | | | | 0.74 | 0.73 | 0.24 |
| 24 664P05 1 12/20/93 57.3 1.82 3.56 0.22 U 47.8 0.58 25.45AP01 1 12/20/93 57.3 1.88 3.73 0.22 U 0.19 U 45.5 0.74 25.345AP01 1 12/20/93 50.3 1.30 2.52 0.26 U 0.22 U 31.9 U 46.5 0.74 27.345AP05 1 12/20/93 50.3 1.67 3.89 0.22 U 0.19 U 45.8 0.64 22 345AP05 1 12/20/93 70.3 1.67 3.89 0.22 U 0.19 U 45.8 0.64 29.45AP03 1 12/20/93 1 12/20/93 1 12/20/93 1 1 12/20/93 1 1 12/20/93 1 1 12/20/93 1 1 12/20/93 1 1 12/20/93 1 1 12/20/93 1 1 12/20/93 1 1 12/20/93 1 1 12/20/93 1 1 12/20/93 66.7 1 1.74 3.22 0.29 U 0.25 U 39.0 0.61 33.3 33.3 345AP02 1 12/20/93 67.3 1 1.80 3.35 0.31 U 0.27 U 40.3 0.61 | | - • | 12/20/93 | 65.8 | 2.05 | 3.98 | | | | 0.79 | 1.02 | |
| 25 345AP01 1 12/20/93 88.4 2.20 5.04 0.22 U 0.19 U 46.5 0.74 2.20 345AP01 1 12/20/93 88.4 2.20 5.04 0.22 U 0.19 U 46.5 0.74 2.20 345AP01 1 12/20/93 70.3 1.67 3.89 0.22 U 0.19 U 45.8 0.43 27 345AP05 1 12/20/93 70.3 1.67 3.89 0.22 U 0.19 U 45.8 0.64 28 345P001 1 12/20/93 109 2.68 6.51 0.24 U 0.21 U 66.6 1.11 30 345AP001 1 12/20/93 111 2.90 6.95 0.22 U 0.19 U 69.6 1.27 33 345AP002 1 12/20/93 67.3 1.80 3.35 0.31 U 0.25 U 39.0 0.61 33 345AP002 1 12/20/93 67.3 1.80 3.35 0.31 U 0.25 U 40.3 0.61 | | | 12/20/93 | 5.23 | 28. | 3.56 | 0.25 U | 0.22 U | 47.8 | 0.58 | 0.18 | o |
| 26 345 APO 122 0.03 0.03 1.30 2.24 0.22 U 0.22 U 0.43 0.43 27 345 APO 122 U 0.22 U 0.22 U 0.23 U 0.25 U 0.22 U 0.43 1.30 2.34 0.22 U 0.22 U 0.43 1.30 2.34 0.22 U 0.22 U 0.31 U 0.20 0.31 U 0.20 0.31 U 0.20 0.31 U 0.20 0.31 U 0.30 0.33 1.30 0.43 0.43 0.345 DO 1 12/20/93 111 2.90 6.95 0.22 U 0.19 U 66.6 1.11 2.30 345 APO 1 12/20/93 66.7 1.74 3.22 0.29 U 0.25 U 0.90 0.61 3.345 DO 1 12/20/93 67.3 1.80 3.35 0.31 U 0.25 U 40.3 0.61 | | | 12/20/93 | 0.70 8.80 | 00.0 | 5.73 | 0.22.0 | 0.19 0 | 46.5 | 0.74 | 1.20 | 0.22 |
| 27 345AP06 1 12/20/93 70.3 1.67 3.89 0.22 U 0.19 U 45.8 0.64 28 345PD01 1 12/20/93 95.2 2.45 5.99 0.23 U 0.20 0.31 1.03 29 345PD03 1 12/20/93 110 2.90 6.95 0.22 U 0.19 U 66.6 1.11 31 345APD04 1 12/20/93 111 2.90 6.95 0.22 U 0.19 U 69.6 1.27 31 345APD04 1 12/20/93 66.7 1.74 3.22 0.29 U 0.25 U 39.0 0.61 33 345APD02 1 12/20/93 67.3 1.80 3.35 0.31 U 0.25 U 40.3 0.61 | | _ | 12/20/93 | 50.3 | 1.30 | 2 0 | | 0.20 | 0.00 | 0.95 | 94.0 | 0.24 |
| 28 345PD01 1 12/20/93 95.2 2.45 5.99 0.23 U 0.20 63.1 1.03 1.87 29 345PD03 1 12/20/93 109 2.68 6.51 0.24 U 0.21 U 66.6 1.11 1.51 30 345PD04 1 12/20/93 111 2.90 6.95 0.22 U 0.19 U 69.6 1.27 2.26 31 33 345QP01 1 12/20/93 66.7 1.74 3.22 0.29 U 0.25 U 39.0 0.61 0.72 32 345QP02 1 12/20/93 66.7 1.80 3.35 0.31 U 0.27 U 40.3 0.61 0.22 33 345QP02 1 12/20/93 67.3 1.80 3.35 0.31 U 0.27 U 40.3 0.61 0.22 33 345QP02 1 12/20/93 67.3 1.80 3.35 0.31 U 0.27 U 40.3 0.61 0.22 33 345QP02 1 1.80 3.35 0.31 U 0.27 U 40.3 0.61 0.22 33 345QP02 1 1.80 3.35 0.31 U 0.27 U 40.3 0.61 0.22 33 345QP02 1 1.80 3.35 0.31 U 0.27 U 40.3 0.61 0.22 33 345QP02 1 1.80 3.35 0.31 U 0.27 U 40.3 0.61 0.22 33 345QP02 1 1.80 3.35 0.31 U 0.27 U 40.3 0.61 0.22 33 345QP02 1 1.80 3.35 0.31 U 0.27 U 40.3 0.61 0.22 33 345QP02 1 1.80 3.35 0.31 U 0.27 U 40.3 0.61 0.22 33 345QP02 1 1.80 3.35 0.31 U 0.27 U 40.3 0.61 0.22 33 345QP02 1 1.80 3.35 0.31 U 0.27 U 40.3 0.61 0.22 33 345QP02 1 1.80 3.35 0.31 U 0.27 U 40.3 0.61 0.22 U | | - | 12/20/93 | 70.3 | 1.67 | 3.89 | | 0.19 U | 45.8 | 0.43 | | o c |
| 29 345PD03 1 12/20/93 109 2.68 6.51 0.24 U 0.21 U 66.6 1.11 1.51 30 345PD04 1 12/20/93 111 2.90 6.95 0.22 U 0.19 U 69.6 1.27 2.26 31 345QP01 1 12/20/93 66.7 1.74 3.22 0.29 U 0.25 U 39.0 0.61 0.72 32 345QP02 1 12/20/93 67.3 1.80 3.35 0.31 U 0.27 U 40.3 0.61 0.22 33 345QP02 1 12/20/93 67.3 1.80 3.35 0.31 U 0.27 U 40.3 0.61 0.22 33 345QP02 1 12/20/93 67.3 1.80 3.35 0.31 U 0.27 U 40.3 0.61 0.22 U 0.22 U 0.22 U 40.3 0.61 0.22 U 0.22 | | - | 12/20/93 | 95.2 | 2.45 | 5.99 | | 0.20 | 63.1 | 1.03 | 1.87 | 0.23 |
| 30.345PD04 1 12/20/93 111 2.90 6.95 0.22 U 0.19 U 69.6 1.27 2.26 31.345QP01 1 12/20/93 66.7 1.74 3.22 0.29 U 0.25 U 39.0 0.61 0.72 32.345QP02 1 12/20/93 67.3 1.80 3.35 0.31 U 0.27 U 40.3 0.61 0.22 3.345QP03 1 12/20/93 67.3 1.80 3.35 0.31 U 0.27 U 40.3 0.61 0.22 U 0.22 U 0.22 U 40.3 0.61 0.22 U 0.2 | | - | 12/20/93 | 109 | 2.68 | 6.51 | | 0.21 U | 9.99 | 1.1 | 100 | |
| 31345QP01 1 12/20/93 66.7 1.74 3.22 0.29 U 0.25 U 39.0 0.61 0.72 1 12/20/93 67.3 1.80 3.35 0.31 U 0.27 U 40.3 0.61 0.22 3.345QP02 1 12/20/93 67.3 1.80 3.35 0.31 0.27 U 40.3 0.61 0.22 | 30 | - | 12/20/93 | 111 | 2.90 | 6.95 | 22 | 0.19 U | 9.69 | 1.27 | 2.26 | 0.22 |
| 32 345QP02 1 12/20/93 67.3 1.80 3.35 0.31 U 0.27 U 40.3 0.61 0.22 | | - | 12/20/93 | 66.7 | 1.74 | 3.22 | 29 | 0.25 U | 39.0 | 0.61 | 0.72 | 0 29 |
| 33 3450D03 1 10/00/00 15 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | | - | 12/20/93 | 67.3 | 1.80 | 3.35 | 31 | 0.27 U | 40.3 | 0.61 | | 0 |
| 3.67 0.35 U 0.31 U 43.1 0.73 U | | - | 12/20/93 | 75.4 | 2.02 | 3.67 | 0.35 U | 0.31 U | 43.1 | 0.73 | 0.95 | |
| . 34 140/150AP01 1 12/20/93 43.4 3.10 2.72 0.25 U 1.07 21.8 1.21 1. | | - | 12/20/93 | 43.4 | 3.10 | 2.72 | 25 | 1.07 | 21.8 | 1.21 | 1.11 | |
| . 35 140/150AP02 1 12/20/93 45.0 2.71 2.25 1.88 0.79 20.7 0.92 | 676WES- 35 140/150AP02 | - | 12/20/93 | 45.0 | 2.71 | 2.25 | 1.88 | 0.79 | 20.7 | 0.92 | 0.76 | |
| 1 12/20/93 0.07 U 0.16 U 0.20 U 0.25 H 0.23 H 0.23 H 0.35 H 0.35 H | Blank-1 | - | 12/20/93 | | 0.16 U | 0.20 | 0.25 | 2 | | 0.05 | 0 | |
| 1 12/20/93 0.07 U 0.16 U 0.25 U 0.25 U 0.23 U 0.25 U | Blank-2 | - | 12/20/93 | | 0.16 U | 0.20 | 0.25 | 22 | 0.231 | 0.55 | 0 0 | 0.25 |

| PESTICIDES IN IN | USACE - WESTATEM PESTICIDES IN MUSSEL TISSUE SAMPLES BATCH 1 | AMPLES | ٥ | concentration | (concentrations in µg/kg wet wt.) | at wt.) | | | | | | |
|---|--|--------------|--------------------------|---------------|-----------------------------------|------------|-------------|----------|----------|--------------------|----------|--------|
| MSL Code | Sponsor ID | Batch | Extract Date | 4,4'-DDE | DELDRIN | 2,4'-DDD | BIODEN | 2,4'-DDT | 4,4'-DDD | ENDO- SULFAN II | 4,4'-DDT | ENDRIN |
| BLANK SPIKE RESULTS | ESULTS | | | | | | | | | | | |
| Amount Spiked | | | | 2 | 10.0 | | 10.0 | | | 2 | 2 | |
| Blank-1 | | - | 12/20/93 | 2 | 0.16 U | | 0.25 U | | | 2 9 | | |
| Blank-1 + Spike 1 | - | - | 12/20/93 | 2 | 8.86 | 2 ! | 9.45 | 10.4 | 2 2 | 2 2 | | |
| Amount Recovered Percent Recovery | ared ny | | | 22 | 8.86 89% | 2 2 | 9.45 95% | 104% | 2 2 | 2 2 | | |
| Amount College | | | | 9 | 10.0 | 2 | 10.0 | 10.0 | 2 | 2 | | |
| Blank-1 | | - | 12/20/93 | 2 | 0.16 U | | 0.25 U | | | 2 | | |
| Blank-1 + Spike 2 | 2 | - | 12/20/93 | 2 | 9.28 | | 9.85 | 10.9 | 2 | 2 | | |
| Amount Recovered Percent Recovery | ared ary | | | 8 8 | 9.28 | 2 2 | 9.85 | 10.9% | <u> </u> | 22 | <u> </u> | |
| MATRIX SPIKE RESULTS | RESULTS | | | | | | | | | | | |
| Amount Spiked | | | | 2 | 10.0 | 8 | 10.0 | | | | | |
| 676WES-11 | 633AP03 | - | 12/20/93 | 2 | 2.38 | 2 5 | 0.23 U | | 2 9 | 99 | 2 2 | |
| 676WES-11 + Spike 1 | Spike 1 | - | 12/20/93 | | 10.7 | 2 2 | 10.4 | 11.5 | 2 2 | | | |
| Percent Recovery | ereu ery | | | 2 2 | 83% | 2 22 | 104% | 115% | 2 | | | |
| Amount Spiked | | | | 92 | 10.0 | 2 | 10.0 | | | | | |
| 676WES-11 | 633AP03 | - | 12/20/93 | | 2.38 | 2 | 0.23 U | | | | | |
| 676WES-11 + Spike 2 | Spike 2 | - | 12/20/93 | | 10.8 | S 2 | 10.5 | 11.8 | 2 | | | |
| Amount Recovered | ered | | | 92 | 8.42 | 2 | 10.5 | 11.8 | 2 | 2 | 2 | |
| Percent Recovery | ery | | | 2 | 84% | <u> </u> | 105% | 118% | 2 | | | |
| U = Not detected at NA = Not applicable. NS = Not spiked. | U = Not detected at or above NA = Not applicable. NS = Not spiked. | the detecti | the detection limit show | _ | | | | | | | | |
| • = Outside Q # → Outside O | * = Outside QC criteria (30-150%). # ← Outside QC criteria (50-120%). | 3%). 0%). | | | | | | | | | | |
| | | | | | | 1 | | | | | | |

| | OSACE - WESTALEM PESTICIDES IN MUSSEL TISSUE S BATCH - | SAMPLES | | | | | | | | | | |
|----------|--|----------------|-----------------|---------------|--|------------------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| | | | | concentration | (concentrations in µg/kg wet wt.) ENDO- | wet wt.) | | | | | | |
| MSL Code | Sponsor ID | Batch | Extract Date | MILEX | SULFAN | METH- OXYCLOR | ENDRIN | TOXAPHENE | AROCLOR 1242 | AROCLOR 1248 | APOCLOR 1254 | AROCLOR 1260 |
| 676WES- | 1 622AP01 | - | 12/20/93 | 0 24 11 | 906 | 1 90 0 | ć | | | • | | |
| 676WES- | 2 622AP03 | - | 12/20/93 | 0.24 U | 4.35 | 0.000 | o c | 242 | 5.00 U | 5.00 | 5.00 | 5.00 |
| 676WES- | 3 622AP06 | - | 12/20/93 | 0.24 U | | 0 00.0 | 0.24 | | 5.00.0 | 9.00 | 5.00 | 5.00 |
| 676WES- | 4 622PD01 | - | 12/20/93 | 0.25 U | | 0.06 U | 0.25 U | | 000.0 | | 5.00 0 | 5.00 |
| 676WES- | 5 622PD03 | - | 12/20/93 | 0.24 U | | 0.06 U | 0.24 U | | 5.00 U | 20.00 | 200.00 | 00.0 |
| 676WES- | 6 622PD05 | - · | 12/20/93 | 0.25 U | | 0.06 U | 0.25 U | | 5.00 U | 5.00 | 5.00 | 5.00 |
| 676WES- | 7 622QP01 | - , | 12/20/93 | 0.26 U | | 0.06 U | 0.47 | 182 | 5.00 U | 5.00 | 5.00 | 5.00 |
| 676WES- | 8 622QP02 | | 12/20/93 | 0.27 U | | 0.07 U | 0.27 U | | 5.00 U | 5.00 | 5.00 | 5.00 |
| GZEWES. | 10 6234503 | | 12/20/93 | 0.26 U | | 0.06 U | 0.26 U | | 5.00 U | 5.00 | | 5.00 |
| 676WES- | 11 633AP03 | | 12/20/93 | 0.25 U | 2.21 | 0.06 U | 0.25 U | | 5.00 U | 5.00 | 5.00 | 5.00 |
| 676WES- | 12 633AP05 | | 12/20/93 | 0.23.0 | 4 | 0.06 U | 0.23 U | | 5.00 U | 5.00 | 5.00 | 2.00 |
| 676WES- | 13 633AG01 | - | 12/20/03 | 0.45.0 | 20.0 | 0.03 | 0.23 U | | 5.00 U | 2.00 | 5.00 | 5.00 |
| 676WES- | 14 633AG02 | - | 12/20/93 | 0.76 | 9 | 0.04 | 0.16.0 | | 5.00 U | 5.00 | 5.00 | 2.00 |
| 676WES- | 15 633AG03 | - | 12/20/93 | 0.24 U | 1.99 | 0.00.0 | 0.20 | 167 | 9.00 | 5.00 0 | 5.00 U | 5.00 |
| 676WES- | 16 633PD01 | - | 12/20/93 | 0.24 U | 2.17 | 0.06 U | 0.24 U | | 200.5 | 00.00 | 5.00 0 | 200.00 |
| 676WES- | 17 633PD03 | - | 12/20/93 | 0.21 U | 2.68 | 0.05 U | 0.21 U | | 5.00 U | 200.5 | 200.5 | 00.10 |
| 676WES- | 18 633PD04 | - | 12/20/93 | 0.26 U | 2.56 | 0.06 U | 0.26 U | | 5.00 U | 5.00 | 5.00 U | 200 |
| 676WES- | 19 66RAP01 | - | 12/20/93 | 0.24 U | 2.92 | 0.06 U | 0.24 U | | 5.00 U | 5.00 | 5.00 U | 5.00 |
| 676WES- | 20 664AP03 | | 12/20/93 | 0.20 U | 7.15 | 0.05 U | 0.20 U | | 5.00 U | 5.00 | 5.00 U | 5.00 |
| GZEWES. | 22 READING | | 12/20/93 | 0.24 U | 3.33 | 0.06 U | 0.24 U | | 5.00 U | 5.00 U | 5.00 U | 5.00 |
| 676WES. | 23 664PD03 | | 12/20/93 | 0.24 U | 2.59 | 0.06 U | 0.24 U | 180 | 5.00 U | 5.00 U | 5.00 U | 5.00 |
| 676WES- | 24 664PD05 | - • | 12/20/93 | 0.25 0 | 2.07 | 0.06 U | 0.25 U | 182 | 5.00 U | 5.00 U | 5.00 U | 5.00 |
| 676WES- | 25 345AP01 | | 12/20/93 | 0.22.0 | 2.23 | 0.05 U | 0.22 U | 183 | 5.00 U | 5.00 U | 5.00 U | 5.00 |
| 676WES- | 26 345AP05 | - | 12/20/93 | 0 44.0 | 5.00 | 0.06 0 | 0.24 U | 209 | 5.00 U | 5.00 U | 5.00 U | 5.00 |
| 676WES- | 27 345AP06 | | 12/20/93 | 0 22 0 | - c | 0.00 | 0.26 0 | 96.7 | 5.00 U | 5.00 U | 5.00 U | 5.00 |
| 676WES- | 28 345PD01 | - | 12/20/93 | 0 23 11 | 2.22 | 0.00.0 | 0.22.0 | 156 | 5.00 U | 5.00 U | 5.00 U | 2.00 |
| 676WES- | 29 345PD03 | - | 12/20/93 | 0.24 11 | 3.67 | 0.00.0 | 0.53.0 | 250 | 5.00 0 | 5.00 U | 5.00 U | 2.00 |
| 676WES- | 30 345PD04 | - | 12/20/93 | 0.22 11 | 4 03 | 0 00.0 | 0.24 0 | 062 | 9.00 0 | 5.00 0 | 5.00 U | 2.00 |
| 676WES- | 31 345QP01 | - | 12/20/93 | 0 29 11 | 20.6 | 0.03 | 0.22.0 | 692 | 5.00 U | 5.00 U | 5.00 U | 2.00 |
| 676WES- | 32 345QP02 | - | 12/20/93 | 0.31 [] | 20.0 | 0.00 | 0.23.0 | 95 | 5.00 U | 5.00 U | 00 | 5.00 |
| 676WES- | 33 345QP03 | - | 12/20/93 | 32 | 200 | 0 00.0 | | 24. | 5.00 U | 5.00 U | 5.00 U | 5.00 |
| 676WES- | 34 140/150AP01 | - | 12/20/93 | | 200 | | 0.000 | 24.0 | 5.00 U | | 5.00 U | |
| 676WES- | 35 140/150AP02 | | 19/90/03 | 2 6 | 7 0 | | 22 | 166 | | | 5.00 U | 5.00 |
| | | - | 56/03/3 | C. | 9. | 0.06 0 | 0.25 U | 153 | 5.00 U | 5.00 U | 5.00 U | 5.00 |
| Blank-1 | | - | 12/20/93 | 0.25 U | 0.25 U | 0.06 U | 0.25 U | 10.0 U | 5.00 U | 5 00 11 | 200 | 4 |
| Blank-Z | | - | 12/20/93 | 0.25 U | 0.25 U | 0.06 U | 0.25 U | 10.0 U | 5.00 U | 5.00 U | 5.00 U | 5.00 |
| | | | | | | | | | | | | |

| MSL Code | USACE - WES/TATEM PESTKIDES IN MUSSEL TISSUE SAMPLES RATCH 1 | AMPLES | 8 | oncentratio | (concentrations in µg/kg wet wt.) | wet wt.) | | | | | | |
|----------------------|--|------------|-----------------|-------------|-----------------------------------|----------|--------|-----------|-----------------|-----------------|-----------------|-----------------|
| | Sponsor ID | Batch | Extract Date | MPEX | ENDO- SULFAN SULFATE | METH | BNDPIN | TOXAPHENE | AROCLOR 1242 | AROCLOR 1248 | AROCLOR 1254 | AROCLOR 1260 |
| | | | | | | | | | | | | |
| BLANK SPIKE RESULTS | RESULTS | | | | | | | | | | | |
| Amount Spiked | 70 | | | 9 | 2 | 2 | 2 | 2 : | 2 2 | 2 2 | 50.0 | _ |
| Blank-1 | | - | 12/20/93 | 2 | 92 | 2 | 2 | 2 : | 2 5 | 2 4 | 2.00 | |
| Blank-1 + Spike 1 | ce 1 | - | 12/20/93 | 2 | 2 | 2 : | 2 9 | 2 4 | 2 4 | 2 2 | 51.4 | |
| Amount Recovered | vered | | | 9 | 2 9 | 2 2 | 2 4 | 2 2 | 2 2 | 2 22 | 103% | |
| Percent Recovery | very | | | 2 | 2 | 2 | 2 | 2 | ! | | | |
| | , | | | 2 | 2 | 2 | 2 | 2 | SZ | 9 | | |
| Amount spiked | | - | 19/90/93 | 2 | 2 | 2 | 2 | 92 | 2 | | | _ |
| Blank-1 | 6 00 | | 12/20/93 | 2 | 2 | 2 | 2 | 2 | 9 | | | |
| Page 1 - Aller | no so | | | 2 | 2 | 92 | 9 | 2 | 2 | | | |
| Percent Recovery | very | | | 2 | 2 | 2 | 2 | 2 | 8 | | %901 %901 | |
| MATRIX SPIKE RESULTS | ERESULTS | | | | | | | | | | | |
| 9 | 3 | | | 2 | 2 | 2 | 2 | 82 | 2 | 2 | | ; |
| Amount Spiked | 50 0 V CC 9 | - | 12/20/93 | 2 | 2 | 2 | 2 | 2 | 9 | | | _ |
| GZEWES-11 + Snike 1 | Spike 1 | | 12/20/93 | 2 | 2 | 2 | 2 | 2 | 2 | | | |
| American Becovered | wered | | | 2 | 2 | 2 | 9 | 9 | 2 | | | |
| Percent Recovery | very | | | 2 | <u>S</u> 2 | 2 | 2 | 9 | 2 | | | |
| | 7 | | | 2 | 9 | 2 | | 2 | 2 | 2 | | : |
| Amount spired | ă | - | 19/00/93 | 2 | 2 | 2 | | | 22 | | | 5 |
| 676WES-11 | 633APU3 | - , | 00/00/07 | 2 | 2 | 2 | | | 92 | | | |
| 676WES-11 + Spike 2 | + Spike 2 | - | 12/20/93 | 2 9 | 2 2 | 2 4 | | | 2 | | 0.09 | |
| Amount Recovered | overed | | | 2 2 | 2 2 | 2 2 | 2 2 | | 2 | 22 | _ | |
| Percent Recovery | overy | | | <u>g</u> | 2 | 2 | | | | | | |
| U = Not det | U = Not detected at or above the detection limit shown | the detect | on limit showr | | | | | | | | | |
| NA = Not applicable. | plicable. | | | | | | | | | | | |
| NS = Not spired. | NS = Not spired. • = Outside QC criteria (30-150%). | .(%) | | | | | | | | | | |
| # = Outside | # = Outside QC criteria (50-120%). | 20%). | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | Page 8 | | | | | | |

Appendix B
Battelle Pacific Northwest
Division Marine Sciences
Laboratory Chemical Report,
16 February 1994 and
25 March 1994



Marine Sciences Laboratory 1529 West Sequim Bay Road Sequim, Washington 98382-9099 Telephone (206) 683-4151 Facsimile (206) 681-3699

February 16, 1994

Dr. Henry Tatem Waterways Experiment Station U. S. Army Corps of Engineers 3909 Halls Ferry Road Vicksburg, MS 39180-6199

Dear Henry:

Enclosed are summary tables containing the final results for pesticides and PCBs for the second batch of 34 remaining tissues. Included with this report are QA/QC summaries outlining the methods used and brief discussions of the data quality objectives for this project. Also enclosed is a computer disk with data for PCB/pests for batch 2 in a LOTUS123 format. This should conclude the deliverables for this project.

If you have any questions please call me at 206-681-3626.

Very truly yours,

Lisa Lefkovitz Environmental Chemist

:mkw

Enc.

QA/QC SUMMARY - FEBRUARY 15, 1994

PROGRAM:

WES

PARAMETER:

Pesticides and Polychlorinated Biphenyl (PCB) Aroclors

LABORATORY:

Battelle/Marine Sciences Laboratory, Sequim, Washington

MATRIX:

Mussel Tissue/ BATCH 2

SAMPLE CUSTODY

A total of 69 mussel samples were received from WES on 11/18/93. All samples were received in good condition. Samples were assigned a Battelle Central File ID Numbers (676WES) and were logged into Battelles log-in system. This QA/QC summary covers batch 2 samples only.

QA/QC DATA QUALITY OBJECTIVES

| | Reference <u>Method</u> | Range of Recovery | SRM Accuracy | Relative <u>Precision</u> | Detection Limit (dry wt) |
|-----------|----------------------------|-------------------|-----------------|------------------------------|-----------------------------------|
| PCB Cong. | GC/ECD | 30-130%/ 50-150% | NA | ≤30% | Pest - 0.5 ng/kg PCB - 5 μg/kg |

METHOD

under ambient conditions following SOP MSL-M-079, "Extraction and Clean-up of Sediment and Tissue for Semivolatile Organics following the Surrogate Internal Standard Method" based on EPA method 3510 and 8080 (EPA1986) and NOAA status and trends methodology (Krahn et al. 1988). Samples were then cleaned using Silica/Alumina (5% deactivated) chromatography followed by HPLC cleanup (Krahn et al. 1988). Extracts were analyzed using Gas Chromatography/Electron Capture Detection (GC/ECD) following SOP MSL-M-044, "Analysis of PCBs and Chlorinated Pesticides by GC/ECD" based on EPA method 8080 (1986). The column used was a J&W DB-17 and the confirmatory column was a DB-1701, both capillary columns (30m x 0.25mm I.D.).

Tissue samples were extracted with methylene chloride using a roller

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QA/QC NARRATIVE/ MUSSELS Pest/PCBs (continued)

HOLDING TIMES

Samples were received on 11/18/93 in good condition. Samples were logged into Battelle's log-in system and stored at approximately -20° C until extraction. Samples were extracted in two batches. The second batch was extracted on 1/5/94. Extracts were analyzed by GC/ECD on 1/27/94, within the established holding time of 40 days from time of extraction (EPA 1986).

DETECTION LIMITS

All results are reported in $\mu g/kg$ wet weight. (Percent moistures are also given.) Method detection limits ranged from 0.5 to 5 $\mu g/kg$ wet wt. for all pesticides and 28 $\mu g/kg$ wet wt for PCB Aroclors. Method detection limits were determined from multiplying the standard deviation of 7 spiked replicates by the student-t value. No statistical MDLs have been determined for Toxaphene, therefore the detection limit reported is based on the instrument detection limit. Note that the detection limits reported with batch 2 are approximately a factor of 2.5 higher than those reported for batch 1. This is a result of injection of less of the sample extract onto the GC to attempt to eliminate further dilutions. This step was taken based on the high levels of certain pesticides detected in mussels from the first batch.

METHOD BLANKS

Two method blanks were extracted with this extraction batch. No pesticides or PCBs were detected above the MDL in any of the blanks with the exception of endrin ketone in one of the blanks. All endrin ketone results in samples associated with the blank were flagged with a B if the concentrations were less than 5 times those detected in the blank.

QA/QC NARRATIVE/ MUSSELS Pest/PCBs (continued)

SURROGATES

Two compounds, PCB congeners 103 and 198, were added to all samples prior to extraction to assess the efficiency of the analysis. Sample surrogate recoveries for all samples were within the QC guidelines of 30-130% for both surrogates with the exception of PCB103 for a number of samples. This was due to intermittant coelution of PCB 103 with g-BHC. When this happened the recovery of PCB 103 was not used to quantify sample results. g-BHC values in these cases were taken from the rear confirmation column.

MATRIX SPIKES

One sample from batch 2 was spiked in duplicate with 6 pesticides and with PCB Aroclor 1254. Matrix spike recoveries for all compounds were within the control limits of 50-150% with the exception of g-BHC in both the spike and spike duplicate. The g-BHC recoveries may be low due to coelution problems on the column which appear to be accentuated by the matrix as blank spike recoveries for g-BHC were good (see below).

BLANK SPIKES

The method blank was also spiked in duplicate with 6 pesticides and Aroclor 1254 prior to extraction. Recoveries for all compounds were within the control limits of 50-150%.

SRMs

No SRMs are presentely available for organics in tissue samples. We are waiting for re-certification of NISTs mussel tissue 1974.

REFERENCES

Krahn et al. "New HPLC Cleanup and Revised Extraction Procedures for Organic Contaminants," NOAA Technical Memorandum NMFS F/NWC-153. 1988.

U.S. Environmental Protection Agency (EPA). 1986. <u>Test Methods for Evaluating Solid Waste:</u>

<u>Physical/Chemical Methods.</u> SW-846. U.S. Document No. 955-001-00000, U.S.E.P.A.,

Washington D.C.

| MSL Code Sponsor ID Batch Date 676WES- 38 140/150AP03 2 1/5/94 676WES- 39 140/150PD02 2 1/5/94 676WES- 39 140/150PD02 2 1/5/94 676WES- 40 140/150PD03 2 1/5/94 676WES- 40 140/150PD03 2 1/5/94 | % Dry Wet Weight Wt (g) | | | | | | |
|--|----------------------------|-----------------|---------------------------------|---|----------|---------|--------|
| 38 140/150AP03 2 1/ 37 140/150PD01 2 1/ 38 140/150PD02 2 1/ 39 140/150PD03 2 1/ | | 500 | (concentratio HEXA- CHLOR | (concentrations in µg/kg wet wt.) HEXA- CHLOR | vet wt.) | HEPTA- | |
| 36 140/150AP03 2 37 140/150PD01 2 88 140/150PD02 2 39 140/150PD03 2 40 140/150PD01 2 | | PCB 103 PCB 198 | BENZENE | #BHC | G-B-C | CHLOR | ALDRIN |
| 37 140/150PD01 2 38 140/150PD02 2 39 140/150PD03 2 40 140/150PD01 2 | | 86% 68% | 0.711 U | 0.248 U | 0.119 U | 0.074 U | 0 962 |
| 38 140/150PD02 2 39 140/150PD03 2 40 140/150DD01 3 | | 82% 75% | 0.709 U | 0.246 U | 0.119 U | | 0.089 |
| 39 140/150PD03 2 | | | 0.706 U | 0.245 U | 0.118 U | 0.074 U | 0.089 |
| 411 140/150001 | | 101% 73% | 0.694 U | 0.242 U | 0.117 U | 0.072 U | 0.088 |
| 7 | | 81% 70% | 0.716 U | 0.250 U | 0.120 U | 0.075 U | 000 |
| 140/150QP02 2 | | 108% 76% | 0.718 U | 0.249 U | 0.120 U | 0.075 U | 1.16 |
| 42 140/150GP03 2 | | 91% 61% | 0.799 U | 0.278 U | 0.134 U | 0.672 | 0,101 |
| 43 /60PP01 2 | | 604% * 66% | 0.557 U | 0.193 U | 0.093 U | 0.386 | 4.65 |
| 44 760PP02 2 | | 1004% * 73% | 0.562 U | 0.196 U | 0.094 U | 0.059 U | 4 06 |
| 45 760PP03 2 | | 206% • 70% | 0.696 U | 0.242 U | 0.117 U | 0.073 U | 2.55 |
| 46 760QP01 2 | | 113% 65% | 0.690 U | 0.241 U | 0.117 U | 0.073 U | 2 95 |
| 47 760QP02 2 | | 125% 63% | 0.708 U | 0.248 U | 0.119 U | 0.075 U | 3.31 |
| 48 760QP03 2 | 17.84 20.62 | 73% 61% | 0.699 U | 0.243 U | 0.118 U | 0.073 U | 2 7 8 |
| 49 633MN01 2 | 15.89 22.52 | | 0.639 U | 0.222 () | 0.10611 | 0.06711 | 200 |
| 50 633MN02 2 | | 740% • 85% | 0.682 U | 0.238 U | 0.115 U | 0.020 | 0.00 |
| 51 633MN03 2 | | 1030% • 72% | 0.710 U | 0.247 U | 0.118 U | 0.073 U | 0.090 |
| 52 /60AP01 2 | | | 0.693 U | 24.1 U | 0.116 U | 0.073 U | 0.087 |
| N (| | | 0.692 U | 0.241 U | 0.117 U | 0.073 U | 0.088 |
| 54 /80QP03 2 | | 108% 70% | 0.650 U | 0.226 U | 0.109 U | 0.068 U | 0.082 |
| 55 /92QP01 2 | | | 0.684 U | 0.239 U | 0.115 U | 0.056 U | 4.72 |
| 54 /92GP02 2 | | | 0.708 U | 0.246 U | 0.120 U | 0.498 | 0.089 |
| 57 7024003 2 | | | O.699 U | 0.244 U | 0.118 U | 0.073 U | 4.34 |
| 56 /82AP01 2 | | | 0.705 U | 0.245 U | 0.119 U | 0.074 U | 0.089 |
| 58 /8ZAPU3 2 | | ω | 0.695 U | 0.242 U | 0.116 U | 0.073 U | 0.087 |
| 64 7000004 2 | | | 0.679 U | 0.236 U | 0.114 U | 0.071 U | 0.085 |
| 69 7000000 | | • | 0.660 U | 0.230 U | 0.110 U | 0.068 U | 0.083 |
| 62 /82FD02 | | | 0.647 U | 0.225 U | 0.108 U | 0.067 U | 0.082 |
| 64 6231703 | | _ | 0.693 U | 0.241 U | 0.116 U | 0.072 U | 1.12 |
| 65 6231 TOS 0 | | • | 0.697 U | 0.242 U | 0.118 U | 0.073 U | 0.089 |
| 65 6331T04 5 | | | 0.626 U | | 0.105 U | 0.066 U | 0.079 |
| 00 0000104 2 | | • | 0.693 U | 0.241 U | 0.117 U | 0.072 U | 0.087 |
| 67 664QP01 2 | | _ | 0.922 U | 0.321 U | 0.155 U | 0.096 U | 0.117 |
| 58 664CP02 2 | 17.01 20.49 | 114% 75% | 0.703 U | 0.245 U | 0.117 U | 0.073 U | 0 088 |
| 3/6WES- 69 664QP04 2 1/5/94 | 15.00 23.07 | 97% 73% | 0.624 U | 0.217 U | 0.105 U | | 0.070 |
| | | | | | | | |
| N · | 15.00 NA | | 0.720 U | 0.250 U | 0.120 U | 0.075 U | 0.091 |
| | 45 00 NA | 7000 | | | | | - |

| Extract % Dry Wet % Becoveries 2 1/5/94 15.00 NA NA 62% 77% 2 1/5/94 15.00 NA NA 62% 77% 2 1/5/94 15.00 NA NA 62% 77% 2 1/5/94 15.00 NA NA 60% 70% 2 1/5/94 15.09 20.77 99.85 110% 80% 2 1/5/94 15.09 20.77 99.85 110% 80% 2 1/5/94 15.09 20.77 99.85 110% 80% 2 1/5/94 15.09 20.77 99.85 110% 80% 2 1/5/94 15.09 20.77 99.85 110% 80% 2 1/5/94 15.09 20.77 99.85 110% 80% 2 1/5/94 15.09 20.26 NA 81% 71% eabove the detection limit shown en from diluted extract (1:10) | | (concentratio | concentrations in µg/kg wet wt.) | : | |
|---|-----------------------------|---------------|----------------------------------|--------------------|--------|
| S 1/5/94 15.00 NA NA 62% 77% NS NS NS 1/5/94 15.00 NA NA 62% 77% NS NS NS 2 1/5/94 15.00 NA NA 62% 77% NS NS 2 1/5/94 15.00 NA NA 62% 77% NS NS NS 2 1/5/94 15.00 20.77 99.85 110% 80% 0.693 U NS | Surrog Recove PCB 103 | | a-BHC G-BHC | HEPTA. HC CHLOR | ALDRIN |
| ALTS 2 1/5/94 15.00 NA NA 62% 73% NS NS NS 1/5/94 15.00 NA NA 62% 77% NS NS NS NS 1/5/94 15.00 NA NA 62% 73% NS NS 1/5/94 15.00 NA NA 60% 70% NS | | | | | |
| LITS 2 1/5/94 15.00 NA NA 64% 77% NS | | 2 | | 2.50 2.50 | 2.50 |
| LITS 2 1/5/94 15.00 NA NA 62% 77% NS NS 1/5/94 15.00 NA NA 60% 70% NS NS 1/5/94 15.00 NA NA 60% 70% NS NS NS 1/5/94 15.09 20.77 99.85 110% 80% 0.693 U 81 2 1/5/94 15.09 20.77 99.85 110% 80% 0.693 U 82 2 1/5/94 15.09 20.77 99.85 110% 80% 0.693 U 82 2 1/5/94 15.09 20.26 NA 81% 71% 33.8 66% at or above the detection limit shown staken from dituted extract (1:10) | 62% | | | ם | 0 |
| LLTS 2 1/5/94 15.00 NA NA 62% 73% NS NS 1/5/94 15.00 NA NA 60% 70% NS | 64% | | | 2.25 1.68 | 1.75 |
| NS 1/5/94 15.00 NA NA 62% 73% NS NS 1/5/94 15.00 NA NA 60% 70% NS | | 9 | | | 1.75 |
| NS 1/5/94 15.00 NA NA 62% 73% NS NS 2 1/5/94 15.00 NA NA 60% 70% NS | | 2 | | %19 %06 | 70% |
| 2 1/5/94 15.00 NA NA 62% 73% NS NS 2 1/5/94 15.00 NA NA 60% 70% NS | | 2 | | 2.50 2.50 | 2.50 |
| NS N | 62% | | | 0.120 U 0.075 U | |
| NS 110% 80% 0.693 U 2 1/5/94 15.09 20.07 99.85 110% 80% 0.693 U 33.6 33.6 33.8 2 1/5/94 15.09 20.77 99.85 110% 80% 0.693 U 2 1/5/94 15.09 20.77 99.85 110% 80% 0.693 U 2 1/5/94 15.09 20.26 NA 81% 71% 33.3 86% above the detection limit shown an from diluted extract (1:10) | %09 | | | 2.53 1.84 | 1.89 |
| NS 1/5/94 15.09 20.77 99.85 110% 80% 0.693 U 2 1/5/94 15.09 20.07 99.85 110% 80% 0.693 U 33.6 50.2 1/5/94 15.09 20.77 99.85 110% 80% 0.693 U 2 1/5/94 15.09 20.77 99.85 110% 80% 0.693 U above the detection limit shown an from diluted extract (1:10) | | 2 | | 2.53 1.84 | 1.89 |
| 50.2 1/5/94 15.09 20.77 99.85 110% 80% 0.693 U 2 1/5/94 15.09 20.00 NA 81% 71% 33.6 33.6 50.2 1/5/94 15.09 20.77 99.85 110% 80% 0.693 U 2 1/5/94 15.09 20.77 99.85 110% 80% 0.693 U above the detection limit shown an from diluted extract (1:10) | | 2 | | 101% 74% | 75% |
| D03 2 1/5/94 15.09 20.77 99.85 110% 80% 0.693 U 33.6 15.09 20.00 NA 81% 71% 33.6 33.6 57% D03 2 1/5/94 15.09 20.77 99.85 110% 80% 0.693 U 50.2 1/5/94 15.09 20.77 99.85 110% 80% 0.693 U 33.3 or above the detection limit shown ken from diluted extract (1:10) | | 50.2 | | 2.52 2.52 | 25.5 |
| DO3 2 1/5/94 15.09 20.07 NA 81% 71% 33.6 33.6 33.6 33.6 33.6 33.6 33.6 33. | 7007 | | | - | 3 7 |
| D03 2 1/5/94 15.09 20.77 99.85 110% 80% 0.693 U 33.3 strength of the detection limit shown liken from diluted extract (1:10) | % 5 0 | | | | 21.16 |
| ad 7792PD03 2 1/5/94 15.09 20.77 99.85 110% 80% 0.693 U + Spike 2 2 1/5/94 15.09 20.26 NA 81% 71% 33.3 yered 2 2 1/5/94 15.09 20.26 NA 81% 71% 33.3 yery acted at or above the detection limit shown results taken from diluted extract (1:10) | 9/ - | | | | 2.0 |
| 50.2 792PD03 2 1/5/94 15.09 20.77 99.85 110% 80% 0.693 U + Spike 2 2 1/5/94 15.09 20.26 NA 81% 71% 33.3 very sected at or above the detection limit shown results taken from diluted extract (1:10) plicable finding | | %29 | | * | 101% |
| 792PD03 2 1/5/94 15.09 20.77 99.85 110% 80% 0.693 U + Spika 2 2 1/5/94 15.09 20.26 NA 81% 71% 33.3 very sected at or above the detection limit shown results taken from diluted extract (1:10) lilicable find diluted by the section limit shown find diluted by the section limit shown find diluted by the section limit shown find diluted by the section diluted extract (1:10) | | 50.2 | | 2.52 2.52 | 2.52 |
| 2 1/5/94 15.09 20.26 NA 81% 71% 33.3 33.3 rebove the detection limit shown ken from diluted extract (1:10) | 110% | | | 0.116 U 0.072 U | |
| 33.3 st or above the detection limit shown taken from diluted extract (1:10) | 81% | | | 0.611 2.29 | 2.61 |
| 86% at or above the detection limit shown staken from diluted extract (1:10) | | 33.3 | 0 | | 2.61 |
| D = Not detected at or above the detection limit shown D = Sample results taken from diluted extract (1:10) NA = Not applicable NC = Not certified NA = Not certified | | %99 | | 24% # 91% | 104% |
| AID - Nied antibad | | | | | |
| not spired ► PCB 103 co-eluted with g-BHC. This surrogate | | | | | |
| was not used in quentitation. - Orienda OC oriente (1800) | | | | | |

Page 2

| MSL Code Sponsor ID Batch Date bBHC DBHC BPCADE 2,6 676WES- 36 140/15OAP03 2 1/5/94 0.248 U 0.243 U 0.241 U 676WES- 37 140/15OPD01 2 1/5/94 U 0.246 U 0.243 U 0.241 U 676WES- 39 140/15OPD03 2 1/5/94 U 0.242 U 0.243 U 0.241 U 676WES- 40 140/15OPD03 2 1/5/94 U 0.242 U 0.243 U 0.241 U 676WES- 41 140/15OPD03 2 1/5/94 U 0.242 U 0.244 U 0.244 U 676WES- 42 140/15OPD03 2 1/5/94 U 0.242 U 0.244 U 0.244 U 676WES- 43 760PD03 2 1/5/94 U 0.242 U 0.241 U 0.241 U 676WES- 43 760PD03 2 1/5/94 U 0.242 U 0.243 U 0.241 U 676WES- 43 760PD03 2 1/5/94 U 0.242 U 0.241 U 0.241 U 676WES- 45 760PD03 2 | 20000000000000000000000000000000000000 | g-CHLOR- DANE 0.248 U 0.427 0.645 0.645 0.645 0.320 0.320 0.320 0.320 0.242 U 0.295 0.347 0.257 0.418 0.418 | | TRANS NONACHLOR 0.060 0.060 0.060 0.061 0.068 0.068 0.046 0.059 0.059 0.059 |
|--|---|---|---|---|
| 36 140/150AP03 2 1/5/94 0.248 U 0.248 U 0.243 U 38 140/150P001 2 1/5/94 0.248 U 0.248 U 0.243 U 0.241 U 0.245 U 0.245 U 0.247 | , | | | 0.066 0.066 0.066 0.066 0.066 0.066 0.066 0.066 0.066 0.066 0.066 |
| 37 140/150AP03 2 1/5/94 0.248 U 0.248 U 0.243 U 0.243 U 37 140/150P001 2 1/5/94 U 0.245 U 0.245 U 0.245 U 0.241 U 38 140/150P002 2 1/5/94 U 0.245 U 0.244 U 0.245 U 0.245 U 0.245 U 0.244 U 0.244 U 0.245 U 0.245 U 0.244 U 0.244 U 0.245 U 0. | | | 0.529 0.535 0.661 0.542 0.592 0.490 0.349 0.437 0.329 0.348 0.538 | 0.060 U 0.060 U 0.060 U 0.061 U 0.486 0.068 U 0.048 U 0.295 0.295 0.297 0.293 0.293 0.293 |
| 38 140150PD02 2 175/94 U 0.246 U 0.246 U 0.241 U 0.241 U 0.245 | 2222222222222 | | 0.535 0.861 0.542 0.592 0.850 0.490 0.191 0.329 0.329 0.338 0.534 | 0.060 0.060 0.060 0.061 0.061 0.092 0.093 0.093 0.093 0.093 |
| 100 100 100 100 100 100 100 100 100 100 | 2222222222222 | | 0.661 0.772 0.548 0.592 0.490 0.329 0.437 0.538 0.538 | 0.060 U 0.664 0.061 U 0.486 0.068 U 0.295 0.058 U 0.293 0.293 0.293 0.293 |
| 40 140/1500P03 2 1/5/94 0 0.250 U 0.242 U 0.245 U 0.276 U 0.276 U 0.276 U 0.276 U 0.276 U 0.277 U 0.277 U 0.277 U 0.278 U 0.277 U 0.277 U 0.277 U 0.278 U 0.277 U 0.277 U 0.278 U 0.277 U 0.277 U 0.278 U 0.278 U 0.277 U 0.278 U 0.277 U 0.278 U 0.277 U 0.278 U 0.277 U 0.27 | | | 0.578 0.548 0.548 0.592 0.490 0.329 0.437 0.538 0.538 | 0.664 0.061 U 0.068 U 0.068 U 0.046 U 0.295 0.297 0.297 0.293 0.293 |
| 41 140/150QPO2 2 1/5/94 U 0.250 U 0.250 U 0.244 U 140/150QPO2 2 1/5/94 U 0.278 U 0.244 U 0.244 U 0.278 U 0.278 U 0.244 U 140/150QPO3 2 1/5/94 U 0.278 U 0.278 U 0.271 U 0.278 U 0.278 U 0.271 U 0.278 U 0.278 U 0.278 U 0.271 U 0.278 | 22222222222 | | 0.548 0.592 0.850 0.349 0.349 0.329 0.329 0.348 0.538 | 0.061 0.486 0.068 0.046 0.295 0.058 0.287 0.293 |
| 42 140/150QPO3 2 1/5/94 0.249 U 0.249 U 0.244 U 0.244 U 0.278 U 0.278 U 0.271 U 44 140/150QPO3 2 1/5/94 0.033 U 0.193 U 0.193 U 0.271 U 45 760PPO1 2 1/5/94 0.195 U 0.193 U 0.195 U 0.235 U 1/5/94 U 0.241 U 0.241 U 0.245 U 0.235 U 0.237 U 0.222 U 0.222 U 0.233 U 0.233 U 0.233 U 0.233 U 0.235 U 1/5/94 U 0.247 U 0.247 U 0.235 U 0.235 U 1/5/94 U 0.241 U 0.247 U 0.235 U 0.235 U 1/5/94 U 0.241 U 0.241 U 0.235 U 0.235 U 1/5/94 U 0.241 U 0.241 U 0.235 U 0.235 U 1/5/94 U 0.241 U 0.241 U 0.235 U 0.235 U 1/5/94 U 0.241 U 0.241 U 0.235 U 0.2 | 2222222222 | | 0.592 0.850 0.490 0.340 0.191 0.329 0.437 0.538 0.538 | 0.486 0.068 0.095 0.295 0.287 0.412 0.293 |
| 44 760PP01 2 1/5/94 U 0.278 U 0.271 U 0.271 U 4 760PP01 2 1/5/94 0.193 U 0.193 U 0.189 U 0.230 U 0.230 U 0.231 | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, | | 0.850 0.490 0.340 0.191 0.329 0.348 0.574 0.651 | 0.068 0.046 0.295 0.058 0.287 0.293 |
| 45 760PP02 2 1/5/94 0.195 U 0.193 U 0.189 U 0.240 U 0.240 U 0.242 U 0.245 U 0.247 U 0.247 U 0.247 U 0.247 U 0.247 U 0.247 U 0.248 U 0. | | | 0.490 0.340 0.191 0.329 0.437 0.348 0.574 0.538 | 0.046 U 0.295 0.058 U 0.287 0.412 0.293 |
| 46 760P03 2 1/5/94 0.242 U 0.242 U 0.991 U 47 760QP03 2 1/5/94 0.242 U 0.242 U 0.236 U 47 760QP03 2 1/5/94 0.242 U 0.242 U 0.236 U 0.245 U 0.247 U 0.248 U 0.247 U 0.242 U 0.247 U 0.242 U 0.247 U 0.242 U 0.247 U 0.247 U 0.242 U 0.247 U 0.247 U 0.242 U 0.247 U 0.247 U 0.247 U 0.248 U 0.247 U 0.248 U 0.247 U 0.248 U 0.247 U 0.248 U 0.248 U 0.248 U 0.247 U 0.248 U 0.2 | | | 0.340 0.191 0.329 0.437 0.348 0.574 0.538 | 0.295 0.058 0.287 0.412 0.293 |
| 46 760QP01 2 1/5/94 0.241 U 0.245 U 0.247 U 0.248 U 0.247 U 0. | | | 0.191 0.329 0.348 0.574 0.538 | 0.058 0.287 0.412 0.293 0.054 |
| 47 760QP02 2 1/5/94 0.241 U 0.241 U 0.225 U 0.245 U 0.245 U 0.245 U 0.245 U 0.245 U 0.245 U 0.246 U 0.246 U 0.246 U 0.247 U 0.242 U 0.247 U 0.247 U 0.247 U 0.242 U 0.247 U 0. | | | 0.329 0.437 0.348 0.574 0.538 | 0.287 0.412 0.293 0.054 |
| 48 760QP03 2 1/5/94 0.246 U 0.246 U 0.247 U 0.242 U 0.247 U 0.247 U 0.247 U 0.242 U 0.247 U 0. | | | 0.437 0.348 0.574 0.538 0.651 | 0.412 0.293 0.054 |
| 48 633MN01 2 1/5/94 0.222 0 0.228 0 0.238 0 0. | | | 0.348 0.574 0.538 0.651 | 0.293 |
| 50 633MN02 2 1/5/94 U 0.238 U 0.235 U | כככככ | | 0.538 0.651 | 0.054 |
| 52 760AP01 2 1/5/94 0 0.247 0 0.242 0 0.242 0 0.242 0 0.245 0 0.247 0 0.242 0 0.242 0 0.247 0 0.247 0 0.242 0 0.242 0 0.247 0 0.247 0 0.245 0 0.236 0 0.236 0 0.236 0 0.237 0 0.237 0 0.237 0 0.237 0 0.237 0 0.237 0 0.237 0 0.237 0 0.237 0 0.237 0 0.237 0 0.237 0 0.237 0 0.237 0 0.247 0 | ,,,,, | | 0.651 | - |
| 52 760AP01 2 1/5/94 U 0.241 U 0.245 U 0.245 U 0.236 U 0.235 U 0.235 U 0.247 U 0.247 U 0.245 U 0.235 U 0.235 U 0.235 U 0.235 U 0.220 U 0.230 U | 222 | | 0.00 | 0.479 |
| 53 760AP02 2 1/5/94 U 0.241 U 0.245 U 0.255 U 54 760QP03 2 1/5/94 U 0.226 U 0.226 U 0.220 U 55 792QP01 2 1/5/94 0.239 U 0.238 U 0.232 U 56 782QP02 2 1/5/94 U 0.246 U 0.246 U 0.241 U | | . = | 0 325 | 0.059 |
| 54 760QP03 2 1/5/94 U 0.226 U 0.226 U 0.220 U 55 792QP01 2 1/5/94 0.239 U 0.238 U 0.232 U 56 782QP02 2 1/5/94 U 0.246 U 0.246 U 0.241 U | | | 0.323 | 0.207 |
| 55 792QP01 2 1/5/94 0.239 U 0.233 U 0.232 U 56 792QP02 2 1/5/94 U 0.246 U 0.246 U 0.241 U | | | 0.486 | 0.330 |
| 56 792QP02 2 1/5/94 U 0.246 U 0.246 U | 0.064 U 0.239 | _ | 0.468 | 0.395 |
| 0.1420 0.540 0.540 | 2 | _ | 0.491 | 0.437 |
| 57 792QP03 2 1/5/94 0.244 U 0.244 U 0.237 U | _ | 0.345 | 0.340 | 0.323 |
| 58 792AP01 2 1/5/94 U 0.245 U 0.245 U 0.241 U | _ | _ | 0.460 | 0.417 |
| 2 1/5/94 U 0.242 U 0.242 U 0.237 U | > | _ | 0.564 | 0.557 |
| 64 703BD04 2 1/5/94 U 0.236 U 0.237 U 0.230 U | . | - | 0.315 | 0.253 |
| 82 703000 0.230 U 0.235 U 0.225 U | . | 5 | 0.577 | 0.567 |
| 63 7020003 3 4/5/04 0.225 U 0.225 U 0.220 U | 5 : | - : | 0.413 | 0.359 |
| 64 6331T0 0 1/2/34 0.241 0 0.241 0 0.235 0 | > : | 0.625 | 0.631 | 0.607 |
| 65 6331T03 2 4/2/04 11 0040 11 0040 11 0040 11 | . | . | 0.331 | 0.297 |
| 68 6331T04 2 4/5/04 11 0.218 U 0.212 U 0.212 U | > : | - : | 0.349 | 0.309 |
| 0.236 U 0.241 U 0.241 U 0.236 U | - | _ | 0.426 | 0.432 |
| 67 664 GPU1 2 1/5/94 U 0.321 U 0.313 U 0.313 U | - | D | 0.467 | 0.369 |
| 00 00444P02 2 1/5/94 U 0.245 U 0.240 U | o n | U 0.327 | 0.398 | 0.339 |
| 68 664QP04 2 1/5/94 U 0.217 U 0.218 U 0.211 U | 0.058 U 0.217 | U 0.264 | 0.312 | 0.270 |
| 1/5/94 0.350 0.350 | | | | |
| 0.244 0 0.230 0 0.230 0 0.244 0 | | U 0.250 | 0.063 U | |
| 0.244 U | 0.067 U 0.250 | | 0.063 U | 0.060 |
| | | | | |
| Page 3 | | | | |

| | USACE - WES/TATEM PESTICIDES IN MUSSEL TISSUE SAMPLES BATCH 2 | | (concent | (concentrations in µg/kg wat wt.) | wet wt.) | | | | | |
|--|---|-----------------|----------|-----------------------------------|-----------------------|----------|-------------------|------------------|------------------|-------|
| MSL Code Sponsor ID | D Batch | Extract Date | ₽-BHC | DBHC | HEPTACHLOR EPOXIDE | 2,4'-DDE | ENDO- SULFAN I | P-CHLOR- DANE | A-CHLOR- DANE | TRANS |
| BLANK SPIKE RESULTS | | | | | | | | | | |
| | | | 2 | | 92 | 2 | 2 | | | |
| Amount Spiked | • | 1/5/94 | 2 22 | 2 2 | 2 | 2 | 2 | 2 | 92 | 2 |
| Dignik i | | 1/5/04 |) | | 2 | 2 | 2 | | | |
| Amount Decovered | J | | | | 2 | 2 | 2 | | | |
| Percent Recovery | | | \$2 | | 2 | 2 | 2 | | | |
| : | | | 7 | | g | | 2 | | | 2 |
| Amount Spiked | • | **** | 2 2 | | 2 2 | | 2 | | | |
| Blank-1 | 7 (| 4,0,0,4 | | | 2 | | 2 | | | |
| Blank-1 + Spike 2 | N | 1/3/84 | 2 2 | | 2 | | 2 | 2 | 22 | |
| Amount Recovered | | | 2 2 | 2 22 | 2 | 2 | 92 | | | |
| reicein necovery | | | | | | | | | | |
| MAININ SPINE RESOLUTION | | | 2 | | 92 | | 92 | | 92 | 2 |
| 8 | | * 6, 4, 7 | 2 7 | | 2 | | 92 | | | |
| 676WES- 1 792PD03 | 2 | 48/0/1 | 2 3 | | 2 9 | | 2 | | | |
| 676WES-63 + Spike 1 | 7 | 1/5/94 | 2 2 | | 2 2 | | 2 2 | | | |
| Amount Recovered | | | zz | 2 2 | 2 2 | 2 2 | 2 | 2 | | |
| Percent Recovery | | | | | | | | | | |
| Amount College | | | 2 | | 92 | 2 | 92 | 2 | | S2 ! |
| COCOCO 4 TOODOO | | 1/5/94 | | | 2 | | 2 | | | |
| Solution of the party of the pa | | 1/5/94 | | | 92 | | 2 | | | |
| 6/6WES-63 + Spike 2 | J | | | | 2 | | 2 | | | |
| Amount Recovered Percent Recovery | | | . ~ | SS SS | 92 | | 72 | | | |
| U = Not detected at or above the detection limit shown | above the detec | tion limit show | _ | | | | | | | |
| D = Sample results taken from diluted extract (1:10) | en from diluted e | extract (1:10) | | | | | | | | |
| NA = Not applicable | | | | | | | | | | |
| NC = Not certified | | | | | | | | | | |
| NS = Not spiked | | | | | | | | | | |
| PCB 103 co-eluted with g-BHC. This surrogate | with g-BHC. This | s surrogate | | | | | | | | |
| was not used in quantitation. | ation. | | | | | | | | | |
| # = Outside QC criteria (50-1 | (50-150%) | | | | | | | | | |
| B = Values detected in samples were <5 x the | samples were < | 5 x the | | | | | | | | |
| levels found in associated blank. | ed blank. | | | | | | | | | |

| PESTICIDES I | USACE - WES/TATEM PESTICIDES IN MUSSEL TISSUE SAMPLES BATCH 2 | AMPLES | | | | | | | | | | |
|--------------|---|------------|-----------------|----------------|----------------------------------|----------|----------|----------|---|--------------------|----------|---------|
| | | | | (concentration | (concentrations in µg/g wet wt.) | et wt.) | | | | | | |
| MSL Code | Sponsor ID | Batch | Extract Date | 4,4'-DDE | DIELDRIN | 2,4'-DDD | ENDRIN | 2,4'-DDT | 4,4'-DDD | ENDO- SULFAN II | 4,4'-DDT | ENDRIN |
| 676WES- 36 | 140/15OAP03 | 8 | 1/5/94 | 34.5 | 200 | | 970 | | • | | | |
| 676WES- 37 | | 8 | 1/5/94 | 34.7 | 0.70 | 200.7 | 0.248 0 | 0.217 U | 12.4 | 0.630 | 1.35 | 0.248 |
| 676WES- 38 | 140/150PD02 | ١٨ | 1/5/94 | 5 2 2 2 | 7.7 | 2.82 | 0.246 U | 0.216 U | 14.2 | 0.693 | 1.49 | 0.246 |
| 676WES- 39 | | 10 | 1/2/0/1 | 7.50 | 40.0 | 4.37 | 0.245 U | 0.215 U | 26.9 | 0.968 | 2.23 | 0.245 |
| | | | 10/84 | 0.00 | 4.34 | 4.86 | 0.242 U | 0.212 U | 26.1 | 1.26 | 3.00 | 0.242 |
| | | u c | 48/0/1 | 37.5 | 2.77 | 2.66 | 0.250 U | 0.217 U | 13.8 | 0.770 | 1.94 | 0.250 |
| | 140/1500000 | u c | 49/0/1 | 43.0 | 3.55 | 3.45 | 0.249 U | 0.218 U | 16.9 | 0.892 | 1.86 | 0.249 |
| | 780PP01 | u c | 46/2/1 | 68.3 | 4.54 | 4.67 | 1.942 | 0.244 U | 25.8 | 0.476 | 0.198 U | |
| | 780PP02 | u c | 40/0/- | 28.1 | 0.124 U | 7.30 | 0.193 U | 0.170 U | 54.6 | 0.983 | 4.28 | 0.193 |
| | 780PP03 | u c | 48/0/1 | 57.0 | 0.124 U | 6.47 | 0.198 U | 0.171 U | 48.3 | 0.779 | 5.19 | 0.1961 |
| | 7800001 | v c | 40/0/4 | 0.09 0.01 | 0.153 U | 3.63 | 0.242 U | 0.212 U | 29.5 | 0.375 | 1.71 | 0.242 U |
| | 7600P02 | u c | 1/5/94 | 53.7 | 0.153 U | 4.72 | 0.241 U | 0.210 U | 33.5 | 1.18 | 6.98 | 0.241 U |
| | 780000 | N C | 1/5/94 | 68.5 | 0.156 U | 6.25 | 0.246 U | 0.215 U | 45.6 | 1.38 | 6.37 | 0.246 U |
| | RASMINO | v c | 1/5/84 | 60.3 | 0.155 U | 4.64 | 0.243 U | 0.212 U | 38.9 | 0.482 | 1.48 B | |
| | BRANDS | v c | 1/5/94 | 98.2 D | 0.141 U | 13.3 | 0.222 U | 0.194 U | 51.0 D | | 20.3 D | |
| | 633MN03 | v 0 | 46/0/1 | 108 D | 0.152 U | 14.5 | 0.238 U | 0.208 U | 55.2 D | | 16.7 | 0.238 |
| | 760AP01 | , , | 1/5/94 | מ אני | 0.156 U | 15.5 | 0.247 U | 0.217 U | 62.9 D | | 28.5 | 0.247 |
| | 760AP02 | , 0 | 1/5/04 | 02.0 | 0.153 U | 4.34 | 0.241 U | 0.212 U | 36.3 | 0.636 | 2.10 | 0.241 U |
| | 760QP03 | ۰ ، | 1/5/04 | 0.4.0 | 0.153 U | 5.26 | 0.241 U | 0.225 U | 45.7 | 0.768 | 2.63 | 0.241 |
| | 792QP01 | , 0 | 1/5/04 | 67.7 | 0.142.0 | 7.86 | 0.226 U | 0.197 U | 64.2 | 1.10 | 5.46 | 0.226 |
| | 792QP02 | ١ ٥ | 1/5/94 | 80 S | 0.151.0 | 04.6 | 0.239 U | 0.209 U | 40.8 | 0.750 | 2.06 | 0.239 |
| 676WES- 57 | 792QP03 | Q | 1/5/94 | 2000 | 0.157.0 | 7.03 | 0.246 0 | 0.216 U | 58.4 | 1.06 | 3.59 | 0.246 |
| 676WES- 58 | 792AP01 | 8 | 1/5/94 | 0.69 | 0.155.0 | - 40 | 0.244.0 | 0.213.0 | 37.3 | 0.721 | 1.90 | 0.244 |
| 676WES- 59 | 792AP03 | 8 | 1/5/94 | 0 00 | 0.130.0 | 7.00 | 0.245.0 | 0.215 U | 49.3 | 0.812 | 2.28 | 0.245 |
| 676WES- 60 | 792AP04 | ~ | 1/5/94 | 52.6 | 0.150 11 | 4 78 | 0.242.0 | 0.21.0 | 61.5 | 1.22 | 11.4 | 0.242 |
| 676WES- 61 | 792PD01 | C4 | 1/5/94 | 84.7 | 0.145 U | 7.03 | 0.000 | 0.200 | 36.2 | 0.656 | 2.27 | 0.236 |
| 676WES- 62 | 792PD02 | 8 | 1/5/94 | 70.1 | 0.143 U | 00.8 | 0.2300 | 0.202.0 | 20.2 | 1.19 | 7.17 | 0.230 |
| 676WES- 63 | 792PD03 | 8 | 1/5/94 | 93.9 | 0.152 U | 20.0 | 0.625.0 | 0.187 | 48.7 | 0.621 | 1.87 | 0.225 |
| 676WES- 64 | 633LT02 | 8 | 1/5/94 | 66.0 | 3.55 | 4 79 | 0.545 11 | 0.42 | 07.1 | 1.32 | 6.40 | 0.241 |
| 676WES- 65 | 633LT03 | 8 | 1/5/94 | 60.1 | 66.6 | 4 15 | 0.242.0 | 0.4.0 | 50.0 | 0.390 | 3.57 | 0.242 |
| 676WES- 66 | 633LT04 | 8 | 1/5/94 | 72.8 | 3.94 | 5 23 | 0.544 | 0.130 | B. C. | 0.45/ | 1.85 | 0.218 |
| 676WES- 67 | 664QP01 | 2 | 1/5/94 | 6 06 | 0 204 11 | 9 4 | 2 4 6 6 | 0.510 | 44.5 | 0.644 | 2.84 | 0.241 |
| 676WES- 68 | 664QP02 | 8 | 1/5/94 | 82.5 | 0.155 11 | 2.5 | 0.3210 | 0.281 0 | 51.9 | 0.906 | 0.228 U | 0.321 |
| 676WES- 69 | 664QP04 | ~ | 1/5/04 | 513 | 2000 | 2 | 0.245 0 | | 55.3 | 0.890 | 0.174 U | 0.245 |
| i | | 1 | | 2 | 0.130 | 3.08 | 0.217 U | 0.190 U | 27.9 | 0.444 | 1.22 B | 0.217 |
| Blank-1 | | 8 | 1/5/94 | 0.069 U | | 0.201 U | 0.250 U | 0.219 U | 0 234 11 | 0 26 0 | 910 | |
| Blank-2 | | 8 | 1/5/94 | 0.069 U | 0.159 U | 0.201 U | | | 0.234 U | 0.250 0 | | 0.250 0 |
| | | | | | | | | | | | | 0.630 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

| PESTICIDES IN MUSSEL TISSUE BATCH 2 | USACE • WES/TATEM PESTICIDES IN MUSSEL TISSUE BATCH 2 | SAMPLES | ಀ | oncentrati | (concentrations in µg/g wet wt.) | wet wt.) | | | | | | |
|--|---|----------------------------------|----------------------------|-------------------------|----------------------------------|----------|--------|----------|------------|--------------------|----------|--------|
| MSL Code Spx | Sponsor ID | Batch | Extract Date 4 | rtract Date 4,4'-DDE | DIELDRIN | 2,4'-DDD | BADRIN | 2,4'-DDT | 4,4'-DDD | ENDO- SULFAN II | 4,4'-DDT | ENDRIN |
| BLANK SPIKE RESULTS | LT3 | | | | | | | | | | | |
| Amount Spiked | | | | 2 | 10.0 | 2 | | | 2 | 2 | 10.0 | _ |
| Blank-1 | | 8 | 1/5/94 | 2 | 0.159 | 92 - | 0 | D | 2 | 2 | 0.316 | - |
| Blank-1 + Spike 1 | | N | 1/5/94 | 2 | 7.63 | 2 | | 2 | 2 ! | 2 9 | 8.34 | |
| Amount Recovered Percent Recovery | | | | 22 | 7.63 | 22 | 84% | 22 | 22 | 22 | 80% | 22 |
| Amount Spiked | | | | 2 | 10.0 | | | | 2 | 2 | 10.0 | 2 |
| Blank-1 | | 8 | 1/5/94 | 2 | 0.159 | - | 0.250 | ם | 2 | 2 | 0.316 | |
| Blank-1 + Spike 2 | | 0 | 1/5/94 | 2 | 8.07 | 2 | | | 2 | 2 | 9.12 | |
| Amount Recovered | | | | 2 | 8.07 | 29 9 | 9.00 | 2 ! | 29 | 29 | 8.80 | 2 5 |
| MATRIX SPIKE RESULTS | ULTS | | | ! | : | ! | | ! | ! | | | |
| Amount Spiked | | | | 2 | 10.1 | 2 | 10.1 | 2 | 2 | 2 | 10.1 | 2 |
| | 792PD03 | 84 | 1/5/94 | 2 | 0.1524 U | | 0.979 | 2 | 2 | 2 | 6.40 | ~ |
| 676WES-63 + Spike 1 | 6 1 | 8 | 1/5/94 | 2 | 12.4 | 2 | 9.84 | 2 | 2 | 2 | 16.7 | |
| Amount Recovered | | | | 2 | 12.4 | 2 | | | 2 | 2 | 10.4 | |
| Percent Recovery | | | | 2 | 123% | 2 | | | 22 | 2 | 103% | 22 |
| Amount Spiked | | | | 2 | 10.1 | | 10.1 | 2 | 92 | | 10.1 | ~ |
| | 792PD03 | 8 | 1/5/94 | 2 | 0.1524 U | | 9.979 | | 2 | | 6.40 | |
| 676WES-63 + Spike 2 | 6.2 | 8 | 1/5/94 | 2 | 11.9 | | | | 2 | | 15.7 | |
| Amount Recovered | | | | 2 | 11.9 | 2 | | 2 | 2 | 2 | 9.30 | |
| Percent Recovery | | | | 2 | 118% | | | 2 | 2 | | 95% | 2 |
| U=Not detected at or above the detection limit show: D=Sample results taken from diluted extract (1:10) | at or above s taken fron | the detection a diluted extra | n limit show act (1:10) | | | | | | | | | |
| NA = Not applicable | • | | | | | | | | | | | |
| NC = Not certified NS = Not spiked | | | | | | | | | | | | |
| * = PCB 103 co-eluted with o-BHC. This surrogate | thad with a-8 | 3HC. This su | rrogate | | | | | | | | | |
| was not used in quantitation. | nantitation. | 2 | 222 | | | | | | | | | |
| # = Outside QC criteria (50-150%) | Iteria (50-1) | 20%) | | | | | | | | | | |
| off v 3v orem columns of betrateb coulett - 6 | | | | | | | | | | | | |

| | BUDEIN KETONE TOX 0.248 U 0.245 U 0.245 U 0.250 U 0.278 U 1.38 B 0.198 U 1.38 B 0.198 U | TOXAPHENE 50.6 50.6 77.0 88.0 35.9 U 34.8 U 72.7 72.7 72.7 72.7 72.7 72.7 72.7 72 | | מרכב בכב ב | AFOCLOR 7 1254 28.0 U 28.0 U 28.0 U 28.0 U | AROCIOR 1260 28.0 28.0 28.0 28.0 |
|---|---|---|--|---|---|--|
| | | כככ ככ כ | ככככככככככ | בכככככככ: | 2222: | 28.0 28.0 28.0 28.0 28.0 28.0 28.0 |
| 0.060 U 0.060 U 0.060 U 0.059 U 0.061 U 0.068 U 0.047 U 0.059 U 0.059 U 0.059 U 0.059 U | 0.248 U 0.246 U 0.245 U 0.242 U 0.250 U 0.249 U 0.278 U 1.38 B 0.198 U 1.02 B 0.241 U | | 28.0 U C 28. | 28.0 U 28 | 28.0 U 28.0 U 28.0 U | 8 8 8 8 8 |
| 0.060 U 0.060 U 0.059 U 0.061 U 0.061 U 0.068 U 0.047 U 0.059 U 0.059 U 0.059 U | 0.246 U 0.245 U 0.242 U 0.250 U 0.273 U 1.38 B 0.196 U 1.02 B 0.241 U | | 2800 C C C C C C S S C C C C C C C C C C C | 286.0 | 28.0 U 28.0 U 28.0 U | 28.0 28.0 28.0 28.0 |
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| 0.068 U 0.046 U 0.047 U 0.058 U 0.057 U 0.059 U 0.059 U | 0.278 U 1.38 B 0.196 U 1.02 B 0.241 U 0.246 U | | 28.0 U 28.0 U 28.0 U 28.0 U | 28.0 U 28.0 U 28.0 U | 28.0 0 | 28.0 |
| 0.046 U 0.047 U 0.058 U 0.057 U 0.059 U 0.059 U | 1.38 B 0.196 U 1.02 B 0.241 U 0.246 U | | 28.0 U 28.0 U 28.0 U | 28.0 U | 28.0 U | 28.0 |
| 0.047 U 0.058 U 0.057 U 0.059 U 0.059 U 0.058 U | 0.196 U 1.02 B 0.241 U 0.246 U | | 28.0 U 28.0 U 28.0 U | 28.0 U | 28.0 U | 28.0 |
| 0.058 U 0.057 U 0.059 U 0.059 U 0.054 U | 1.02 B 0.241 U 0.246 U | | 28.0 U 28.0 U | | 28.0 U | 28.0 |
| 0.057 U 0.059 U 0.059 U 0.054 U 0.058 U | 0.241 U 0.246 U | 4 7 | 28.0 U | 28.0 U | 28.0 U | 28.0 |
| 0.059 U 0.059 U 0.054 U 0.058 U | 0.246 U | | | 28.0 U | 28.0 U | 28.0 |
| 0.054 U 0.058 U | | 92.0 | 28.0 0 | 28.0 U | 28.0 U | 28.0 |
| 0.058 U | 0.243 U | 56.7 | 28.0 U | 28.0 0 | 28.0 U | 28.0 |
| 0 | 0.222.0 | 165 | 28.0 0 | 28.0 U | 28.0 U | 28.0 |
| 0.059 U | 0.247 U | 177 | 28.00 | 28.0 0 | 28.0 0 | 28.0 |
| 0.058 U | 0.241 U | | 28.0 U | 28.0 0 | 28.00 | 0.00 |
| 0.058 U | 0.837 B | | 28.0 U | 28.0 U | 28.0 U | 28.0 |
| 0.055 U | 0.226 U | 81.5 | 28.0 U | 28.0 U | 28.0 U | 28.0 |
| 0.058 U | 0.239 U | 31.4 U | 28.0 U | 28.0 U | 28.0 U | 28.0 |
| 0.059 U | 0.246 U | 90.3 | 28.0 U | 28.0 U | 28.0 U | 28.0 |
| 0.058 U | 1.22 8 | 80.8 | 28.0 U | 28.0 U | 28.0 U | 28.0 |
| 0.050.0 | 0.855 B | | 28.0 U | 28.0 U | 28.0 U | 28.0 |
| 0.038 0 | 0.242 U | | 28.0 U | 28.0 U | 28.0 U | 28.0 |
| 0.055.0 | 4 22 0 | | 28.0 U | 28.0 0 | 28.0 U | 28.0 |
| 0.054 11 | 0 225 11 | | 28.00 | 28.0 0 | 28.0 U | 28.0 |
| 0.059 U | 0.241 [] | 111 | 20.00 | 20.00 | 28.0 0 | 28.0 |
| 0.058 U | 0.242 U | | 28.00 | 0.00 | 28.00 | 28.0 |
| 0.053 U | 0.218 U | | 28.00 | 20.00 | 28.0 0 | 28.0 |
| 0.058 U | 0.606 B | | 28.00 | 0.00 | 28.00 | 28.0 |
| 0.078 U | 0.321 U | | 28.0.0 | 0.00 | 20.00 | 28.0 |
| 0.060 U | 0.245 U | | 28.00 | 20.00 | | 28.0 |
| 0.052 U | | | 28.0 U | 28.0.0 | | 20.0 |
| | , | | |) | | |
| | 0.526 | | 28.0 U | 28.0 11 | _ | ac |
| | 0.250 U | | 28.0 U | 0 ac | | 0.00 |
| | | U 0.526 | U 0.522 U 1655 U 0.222 U 1650 U 0.238 U 150 U 0.242 U 32.3 U 0.258 U 0.258 U 0.258 U 0.258 U 0.245 U 0.255 U 0 | U 0.522 U 165 U 0.223 U 165 U 0.247 U 177 U 0.247 U 177 U 0.224 U 32.3 U U 0.226 U 81.5 U U 0.226 U 90.3 U 0.242 U 90.3 U 0.242 U 36.4 U U 0.242 U 37.7 U U 0.245 U 27.7 U U 0.245 U 27.7 U U 0.245 U 27.7 U U 0.245 U 27.7 U U 0.245 U 77.1 U U 0.245 U 77.1 U U 0.245 U 77.1 U | U 0.522 U 165 28.0 U 28.0 U 0.238 U 150 28.0 U 28.0 U 0.247 U 177 28.0 U 28.0 U 0.245 U 32.3 U 28.0 U 28.0 U 0.258 U 31.4 U 28.0 U 28.0 U 0.245 U 31.4 U 28.0 U 28.0 U 0.242 U 36.2 U 28.0 U 28.0 U 0.242 U 36.4 U 28.0 U 28.0 U 0.242 U 36.4 U 28.0 U 28.0 U 0.242 U 36.4 U 28.0 U 28.0 U 0.242 U 11.2 B 33.3 U 28.0 U 28.0 U 0.242 U 11.1 U 11.1 U 0.245 U 21.9 U 28.0 U 28.0 U 0.245 U 27.7 U 28.0 U 28.0 U 0.245 U 71.1 C 28.0 U | U 0.522 U 165 28.0 U 28.0 U 0.238 U 150 28.0 U 28.0 U 0.247 U 177 28.0 U 28.0 U 28.0 U 0.247 U 32.3 U 28.0 U 28.0 U 0.258 U 31.5 U 28.0 U 28.0 U 0.258 U 31.4 U 28.0 U 28.0 U 0.258 U 31.4 U 28.0 U 28.0 U 0.258 U 31.4 U 28.0 U 28.0 U 0.258 U 32.2 U 28.0 U 28.0 U 0.258 U 33.3 U 28.0 U 28.0 U 0.242 U 33.3 U 28.0 U 28.0 U 0.242 U 27.7 U 28.0 U 28.0 U 0.242 U 27.7 U 28.0 U 28.0 U 0.242 U 27.7 U 28.0 U 28.0 U 0.245 U 0.258 U 28.0 U 28.0 U 0.245 U 0.258 U 28.0 U 28.0 U 0.258 U 0.258 U 28.0 U 28.0 U 0.258 U 0.258 U 28.0 U 28.0 U 0.258 U 0.258 U 28.0 U 28 |

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|--|--|--|--|--|--|--|--|--|--|------------------------|---------------------|---------------|---------|-------------------|------------------|------------------|---------------|----------------|-------------------|------------------|------------------|----------------------|-------------|-------------------|---------|------------------|------------------|---------------|-------------------|--------|------------------|------------------|--------------|------------------------------------|---------------------|--------------------|-------------|-------------------------------|-----------------------------------|---|
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Appendix C Statistical Analyses of Some of Big Sunflower Mussel Contaminants Data

CADMIUM (ppm wet wt.) IN MUSSELS FROM THE SUNFLOWER RIVER

| OBS | TREATMENT GROUP | N | MEAN CONTAMINANT CONC. | VARIANCE | STANDARD ERROR |
|-----|--------------------|----|------------------------------|----------|-------------------|
| 1 | 34.5 | 9 | 0.14222 | .0082062 | 0.030196 |
| 2 | 62.2 | 9 | 0.08290 | .0028480 | 0.017789 |
| 3 | 63.3 | 12 | 0.09031 | .0015732 | 0.011450 |
| 4 | 66.4 | 9 | 0.07904 | .0012740 | 0.011898 |
| 5 | 76.0 | 9 | 0.08542 | .0005001 | 0.007455 |
| 6 | 79.2 | 9 | 0.09076 | .0020649 | 0.015147 |
| 7 | 140.0 | 9 | 0.07799 | .0006882 | 0.008744 |

COMPARISON OF MEAN BIOACCUMULATION WITH ACTION LEVEL: UPPER CONFIDENCE LIMITS (UCL) WHEN VARIANCES ARE UNEQUAL CADMIUM

| TREATMENT GROUP | MEAN BIOACCUMULATION | * UCL (UNEQUAL VARIANCES) | VARIANCE | T VALUE FOR (1-ALPHA=.95,N-1) | N | MINIMUM SIGNIFICANT DIFFERENCE |
|---|---|---|--|--|------------------------|--|
| 34.5 62.2 63.3 66.4 76.0 79.2 140.0 | 0.14222 0.08290 0.09031 0.07904 0.08542 0.09076 0.07799 | 0.19837 0.11598 0.11087 0.10116 0.09928 0.11892 0.09425 | .0082062 .0028480 .0015732 .0012740 .0005001 .0020649 | 1.85955 1.85955 1.79588 1.85955 1.85955 1.85955 | 9 12 9 9 9 | 0.056151 0.033079 0.020563 0.022125 0.013862 0.028167 0.016261 |

POWER TO DETECT % DECREASE IN CONCENTRATION BELOW ACTION LEVEL OF 0.5 ppm GIVEN N, MSE AND DF FROM ANOVA

| % DECREASE BELOW ACTION LEVEL | MEAN BIOACCUMULATION | D | T VALUE FOR (1-BETA,DF) | POWER (1-BETA) |
|---|-------------------------|------|-------------------------------|-------------------|
| 10 | 0.45 | 0.05 | 1.3869 | 0.91466 |
| 20 | 0.40 | 0.10 | 4.4449 | 0.99998 |
| 30 | 0.35 | 0.15 | 7.5029 | 1.00000 |
| 40 | 0.30 | 0.20 | 10.5610 | 1.00000 |
| 50 | 0.25 | 0.25 | 13.6190 | 1.00000 |
| | | | | |

^{* 95} Percent upper confidence limit values used in Table 8.

MERCURY (ppm wet wt.) IN MUSSELS FROM THE SUNFLOWER RIVER

| OBS | TREATMENT GROUP | N | MEAN CONTAMINANT CONC. | VARIANCE | STANDARD ERROR |
|----------------------------|---|-----------------------------|--|--|--|
| 1 2 3 4 5 6 | 34.5 62.2 63.3 66.4 76.0 79.2 140.0 | 9 9 12 9 9 9 | 0.018773 0.014276 0.020160 0.014489 0.014916 0.015822 0.012587 | .00003884 .00002875 .00013487 .00000801 .00001490 .00000606 | .0020773 .0017872 .0033525 .0009436 .0012869 .0008208 |

COMPARISON OF MEAN BIOACCUMULATION WITH ACTION LEVEL: UPPER CONFIDENCE LIMITS (UCL) WHEN VARIANCES ARE UNEQUAL MERCURY

| TREATMENT | | ★ UCL | | T VALUE FOR (1-ALPHA=.95,N-1) | N | MINIMUM SIGNIFICANT DIFFERENCE |
|--|--|--|--|--|------------------------|--|
| GROUP 34.5 62.2 63.3 66.4 76.0 79.2 140.0 | 0.018773 0.014276 0.020160 0.014489 0.014916 0.015822 0.012587 | VARIANCES) 0.022636 0.017599 0.026181 0.016244 0.017309 0.017349 0.013406 | VARIANCE .00003884 .00002875 .00013487 .00000801 .00001490 .00000606 | 1.85955 1.85955 1.79588 1.85955 1.85955 1.85955 | 9 9 12 9 9 | .0038628 .0033234 .0060207 .0017547 .0023930 .0015263 .0008193 |

POWER TO DETECT % DECREASE IN CONCENTRATION BELOW ACTION LEVEL OF 0.1 ppm GIVEN N, MSE AND DF FROM ANOVA

| % DECREASE BELOW ACTION LEVEL | MEAN BIOACCUMULATION | D | T VALUE FOR (1-BETA,DF) | POWER (1-BETA) |
|---|--------------------------------------|--------------------------------------|---|--|
| 10 20 30 40 50 | 0.09 0.08 0.07 0.06 0.05 | 0.01 0.02 0.03 0.04 0.05 | 3.1654 8.0018 12.8383 17.6748 22.5113 | 0.99877 1.00000 1.00000 1.00000 |

POWER TO DETECT % DECREASE IN CONCENTRATION BELOW ACTION LEVEL OF 1.0 ppm GIVEN N, MSE AND DF FROM ANOVA

| % DECREASE BELOW ACTION LEVEL | MEAN BIOACCUMULATION | D | T VALUE FOR (1-BETA,DF) | POWER (1-BETA) |
|---|---------------------------------|---------------------------------|---|-------------------|
| 10 20 30 40 50 | 0.9 0.8 0.7 0.6 0.5 | 0.1 0.2 0.3 0.4 0.5 | 46.694 95.058 143.423 191.788 240.152 | 1 1 1 1 |

LEAD (ppm wet wt.) IN MUSSELS FROM THE SUNFLOWER RIVER

| OBS | TREATMENT GROUP | N | MEAN CONTAMINANT CONC. | VARIANCE | STANDARD ERROR |
|-----|--------------------|----|------------------------------|----------|-------------------|
| 022 | 01.001 | | 551.5 | | |
| 1 | 34.5 | 9 | 0.08322 | .0005548 | 0.007851 |
| 2 | 62.2 | 9 | 0.04668 | .0000418 | 0.002154 |
| 3 | 63.3 | 12 | 0.10052 | .0019749 | 0.012829 |
| 4 | 66.4 | 9 | 0.06784 | .0006019 | 0.008178 |
| 5 | 76.0 | 9 | 0.06862 | .0003676 | 0.006391 |
| 6 | 79.2 | 9 | 0.07227 | .0001922 | 0.004621 |
| 7 | 140.0 | 9 | 0.04377 | .0001079 | 0.003462 |

COMPARISON OF MEAN BIOACCUMULATION WITH ACTION LEVEL: UPPER CONFIDENCE LIMITS (UCL) WHEN VARIANCES ARE UNEQUAL LEAD

| TREATMENT GROUP | MEAN BIOACCUMULATION | → UCL (UNEQUAL VARIANCES) | VARIANCE | T VALUE FOR (1-ALPHA=.95,N-1) | N | MINIMUM SIGNIFICANT DIFFERENCE |
|--------------------|-------------------------|---------------------------|----------|-------------------------------|----|--------------------------------------|
| 34.5 | 0.08322 | 0.09782 | .0005548 | 1.85955 | 9 | 0.014600 |
| 62.2 | 0.04668 | 0.05069 | .0000418 | 1.85955 | 9 | 0.004005 |
| 63.3 | 0.10052 | 0.12356 | .0019749 | 1.79588 | 12 | 0.023039 |
| 66.4 | 0.06784 | 0.08305 | .0006019 | 1.85955 | 9 | 0.015207 |
| 76.0 | 0.06862 | 0.08051 | .0003676 | 1.85955 | 9 | 0.011885 |
| 79.2 | 0.07227 | 0.08086 | .0001922 | 1.85955 | 9 | 0.008594 |
| 140.0 | 0.04377 | 0.05021 | .0001079 | 1.85955 | 9 | 0.006438 |

POWER TO DETECT % DECREASE IN CONCENTRATION BELOW ACTION LEVEL OF 0.3 ppm GIVEN N, MSE AND DF FROM ANOVA

| % DECREASE BELOW ACTION LEVEL | MEAN BIOACCUMULATION | D | T VALUE FOR (1-3ETA,DF) | POWER (1-BETA) |
|---|-------------------------|------|-------------------------------|-------------------|
| 10 | 0.27 | 0.03 | 1.9398 | 0.97140 |
| 20 | 0.24 | 0.06 | 5.5507 | 1.00000 |
| 30 | 0.21 | 0.09 | 9.1615 | 1.00000 |
| 40 | 0.18 | 0.12 | 12.7724 | 1.00000 |
| 50 | 0.15 | 0.15 | 16.3833 | 1.00000 |
| | | | | |

SELENIUM (ppm wet wt.) IN MUSSELS FROM THE SUNFLOWER RIVER

| OBS | TREATMENT GROUP | N | MEAN CONTAMINANT CONC. | VARIANCE | STANDARD ERROR |
|----------------------------|---|------------------------|---|--|--|
| 1 2 3 4 5 6 | 34.5 62.2 63.3 66.4 76.0 79.2 140.0 | 9 9 12 9 9 | 0.46844 0.44604 0.44333 0.37547 0.39022 0.36569 0.36818 | 0.010196 0.001092 0.004398 0.001484 0.004985 0.002539 0.000409 | 0.033659 0.011014 0.019144 0.012839 0.023534 0.016796 0.006743 |

COMPARISON OF MEAN BIOACCUMULATION WITH ACTION LEVEL: UPPER CONFIDENCE LIMITS (UCL) WHEN VARIANCES ARE UNEQUAL SELENIUM

| TREATMENT GROUP | MEAN BIOACCUMULATION | ★ UCL (UNEQUAL VARIANCES) | VARIANCE | T VALUE FOR (1-ALPHA=.95,N-1) | | MINIMUM SIGNIFICANT DIFFERENCE |
|---|---|---|--|--|-----------------------------|--|
| 34.5 62.2 63.3 66.4 76.0 79.2 140.0 | 0.46844 0.44604 0.44333 0.37547 0.39022 0.36569 0.36818 | 0.53103 0.46652 0.47771 0.39934 0.43398 0.39692 0.38072 | 0.010196 0.001092 0.004398 0.001484 0.004985 0.002539 0.000409 | 1.85955 1.85955 1.79588 1.85955 1.85955 1.85955 | 9 9 12 9 9 9 | 0.062590 0.020480 0.034380 0.023874 0.043762 0.031233 0.012539 |

POWER TO DETECT % DECREASE IN CONCENTRATION BELOW ACTION LEVEL OF 0.5 ppm GIVEN N, MSE AND DF FROM ANOVA

| % DECREASE BELOW ACTION LEVEL | MEAN BIOACCUMULATION | D | T VALUE FOR (1-BETA,DF) | POWER (1-BETA) |
|---|--------------------------------------|--------------------------------------|---|--|
| 10 20 30 40 50 | 0.45 0.40 0.35 0.30 0.25 | 0.05 0.10 0.15 0.20 0.25 | 0.8195 3.3101 5.8006 8.2912 10.7818 | 0.79209 0.99920 1.00000 1.00000 |

CHROMIUM (ppm wet wt.) IN MUSSELS FROM THE SUNFLOWER RIVER

| | TREATMENT | | MEAN CONTAMINANT | • | STANDARD |
|-----|-----------|----|---------------------|----------|----------|
| OBS | GROUP | N | CONC. | VARIANCE | ERROR |
| 1 | 34.5 | 9 | 0.23788 | 0.004092 | 0.021323 |
| 2 | 62.2 | 9 | 0.23556 | 0.003459 | 0.019605 |
| 3 | 63.3 | 12 | 0.19951 | 0.002793 | 0.015255 |
| 4 | 66.4 | 9 | 0.26057 | 0.009401 | 0.032320 |
| 5 | 76.0 | 9 | 0.25442 | 0.014615 | 0.040298 |
| 6 | 79.2 | 9 | 0.45173 | 0.025070 | 0.052778 |
| 7 | 140.0 | 9 | 0.13872 | 0.000000 | 0.000000 |

COMPARISON OF MEAN BIOACCUMULATION WITH ACTION LEVEL: UPPER CONFIDENCE LIMITS (UCL) WHEN VARIANCES ARE UNEQUAL CHROMIUM

| TREATMENT GROUP | MEAN BIOACCUMULATION | ★ UCL (UNEQUAL VARIANCES) | VARIANCE | T VALUE FOR (1-ALPHA=.95,N-1) | N | MINIMUM SIGNIFICANT DIFFERENCE |
|--------------------|-------------------------|---------------------------------|----------------------|-------------------------------|----|--------------------------------------|
| 34.5 62.2 | 0.23788 0.23556 | 0.27754 0.27201 | 0.004092 0.003459 | 1.85955 1.85955 | 9 | 0.039651 0.036456 |
| 63.3 | 0.19951 | 0.22690 | 0.002793 | 1.79588 | 12 | 0.027397 |
| 66.4 | 0.26057 | 0.32067 | 0.009401 | 1.85955 | 9 | 0.060100 |
| 76.0 | 0.25442 | 0.32935 | 0.014615 | 1.85955 | 9 | 0.074936 |
| 79.2 | 0.45173 | 0.54988 | 0.025070 | 1.85955 | 9 | 0.098144 |
| 140.0 | 0.13872 | 0.13872 | 0.000000 | 1.85955 | 9 | 0.000000 |

POWER TO DETECT % DECREASE IN CONCENTRATION BELOW ACTION LEVEL OF 0.2 ppm GIVEN N, MSE AND DF FROM ANOVA

| % DECREASE BELOW ACTION LEVEL | MEAN BIOACCUMULATION | D | T VALUE FOR (1-BETA,DF) | POWER (1-BETA) |
|---|-------------------------|------|-------------------------------|-------------------|
| 10 | 0.18 | 0.02 | -1.00852 | 0.15866 |
| 20 | 0.16 | 0.04 | -0.34594 | 0.36531 |
| 30 | 0.14 | 0.06 | 0.31664 | 0.62368 |
| 40 | 0.12 | 0.08 | 0.97921 | 0.83426 |
| 50 | 0.10 | 0.10 | 1.64179 | 0.94702 |

DIELDRIN (ppb wet wt.) IN MUSSELS FROM THE SUNFLOWER RIVER

| OBS | TREATMENT GROUP | N | MEAN CONTAMINANT CONC. | VARIANCE | STANDARD ERROR |
|----------------------------|---|------------------------|---|---|---|
| 1 2 3 4 5 6 | 34.5 62.2 63.3 66.4 76.0 79.2 140.0 | 9 9 15 9 9 | 2.08444 2.83889 1.97267 2.80111 0.14444 0.15222 3.32333 | 0.2697 0.5841 1.5313 11.7741 0.0002 0.0000 0.6198 | 0.17311 0.25476 0.31951 1.14378 0.00503 0.00222 0.26242 |

COMPARISON OF MEAN BIOACCUMULATION WITH ACTION LEVEL: UPPER CONFIDENCE LIMITS (UCL) WHEN VARIANCES ARE UNEQUAL DIELDRIN

| TREATMENT GROUP | MEAN BIOACCUMULATION | ≭ UCL (UNEQUAL VARIANCES) | VARIANCE | T VALUE FOR (1-ALPHA=.95,N-1) | N | MINIMUM SIGNIFICANT DIFFERENCE |
|---|---|---|---|--|------------------------|---|
| 34.5 62.2 63.3 66.4 76.0 79.2 140.0 | 2.08444 2.83889 1.97267 2.80111 0.14444 0.15222 3.32333 | 2.40635 3.31262 2.53542 4.92802 0.15380 0.15635 3.81132 | 0.2697 0.5841 1.5313 11.7741 0.0002 0.0000 0.6198 | 1.85955 1.85955 1.76131 1.85955 1.85955 1.85955 | 9 9 15 9 9 | 0.32191 0.47373 0.56275 2.12691 0.00935 0.00413 0.48799 |

POWER TO DETECT % DECREASE IN CONCENTRATION BELOW ACTION LEVEL OF 100 ppb GIVEN N, MSE AND DF FROM ANOVA

| % DECREASE BELOW ACTION LEVEL | MEAN BIOACCUMULATION | D | T VALUE FOR (1-BETA,DF) | POWER (1-BETA) |
|---|----------------------------|----------------------------|---|-------------------|
| 10 20 30 40 50 | 90 80 70 60 50 | 10 20 30 40 50 | 19.257 40.183 61.110 82.036 102.963 | 1 1 1 1 |

POWER TO DETECT % DECREASE IN CONCENTRATION BELOW ACTION LEVEL OF 300 ppb GIVEN N, MSE AND DF FROM ANOVA

| % DECREASE BELOW ACTION LEVEL | MEAN BIOACCUMULATION | D | T VALUE FOR (1-BETA,DF) | POWER (1-BETA) |
|---|---------------------------------|------------------------------|--|-------------------|
| 10 20 30 40 50 | 270 240 210 180 150 | 30 60 90 120 150 | 61.110 123.889 186.668 249.448 312.227 | 1 1 1 1 |

DDTM (ppb wet wt.) IN MUSSELS FROM THE SUNFLOWER RIVER

| | TREATMENT | | MEAN CONTAMINANT | | STANDARD |
|-----|-----------|----|---------------------|----------|----------|
| OBS | GROUP | N | CONC. | VARIANCE | ERROR |
| 1 | 34.5 | 9 | 138.027 | 1325.62 | 12.1364 |
| 2 | 62.2 | 9 | 181.507 | 2128.36 | 15.3781 |
| 3 | 63.3 | 15 | 145.716 | 1217.78 | 9.0103 |
| 4 | 66.4 | 9 | 148.746 | 4368.73 | 22.0321 |
| 5 | 76.0 | 9 | 114.663 | 623.39 | 8.3226 |
| 6 | 79.2 | 9 | 134.507 | 833.06 | 9.6209 |
| 7 | 140.0 | 9 | 71.193 | 304.19 | 5.8136 |

COMPARISON OF MEAN BIOACCUMULATION WITH ACTION LEVEL: UPPER CONFIDENCE LIMITS (UCL) WHEN VARIANCES ARE UNEQUAL DDTM

| TREATMENT GROUP | MEAN BIOACCUMULATION | ∜ UCL (UNEQUAL VARIANCES) | VARIANCE | T VALUE FOR (1-ALPHA=.95,N-1) | N | MINIMUM SIGNIFICANT DIFFERENCE |
|--------------------|-------------------------|---------------------------------|----------|-------------------------------|----|--------------------------------------|
| 34.5 | 138.027 | 160.595 | 1325.62 | 1.85955 | 9 | 22.5681 |
| 62.2 | 181.507 | 210.103 | 2128.36 | 1.85955 | 9 | 28.5963 |
| 63.3 | 145.716 | 161.586 | 1217.78 | 1.76131 | 15 | 15.8699 |
| 66.4 | 148.746 | 189.715 | 4368.73 | 1.85955 | 9 | 40.9698 |
| 76.0 | 114.663 | 130.140 | 623.39 | 1.85955 | 9 | 15.4763 |
| 79.2 | 134.507 | 152.397 | 833.06 | 1.85955 | 9 | 17.8906 |
| 140.0 | 71.193 | 82.004 | 304.19 | 1.85955 | 9 | 10.8107 |

POWER TO DETECT % DECREASE IN CONCENTRATION BELOW ACTION LEVEL OF 1000 ppb GIVEN N, MSE AND DF FROM ANOVA

| DECREASE BELOW ACTION LEVEL | MEAN BIOACCUMULATION | D | T VALUE FOR (1-BETA,DF) | POWER (1-BETA) |
|--------------------------------------|-------------------------|-----|-------------------------------|-------------------|
| 10 | 900 | 100 | 6.0465 | 1.00000 |
| 20 | 800 | 200 | 13.7629 | 1.00000 |
| 30 | 700 | 300 | 21.4792 | 1.00000 |
| 40 | 600 | 400 | 29.1955 | 1.00000 |
| 50 | 500 | 500 | 36.9119 | 1.00000 |

POWER TO DETECT % DECREASE IN CONCENTRATION BELOW ACTION LEVEL OF 5000 ppb GIVEN N, MSE AND DF FROM ANOVA %

| DECREASE BELOW ACTION LEVEL | MEAN BIOACCUMULATION | D | T VALUE FOR (1-BETA,DF) | POWER (1-BETA) |
|--------------------------------------|-------------------------|------|-------------------------------|-------------------|
| 10 | 4500 | 500 | 36.912 | 1 |
| 20 | 4000 | 1000 | 75.494 | 1 |
| 30 | 3500 | 1500 | 114.075 | 1 |
| 40 | 3000 | 2000 | 152.657 | 1 |
| 50 | 2500 | 2500 | 191.238 | 1 |
| | | | | |

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13. ABSTRACT (Maximum 200 words)

Nine species of freshwater mussels collected from the Big Sunflower River, Mississippi, in 1993 were chemically analyzed for three classes of environmental contaminants. There was a proposal to harvest these animals for their shells and to use the tissues for animal feed. Mussels were collected from eight sites, from River Miles 34.5 to 150 (near Cleveland, MS). The tissues were analyzed for metals, pesticides, and polychlorinated biphenyls (PCBs). Metals, including Cd, Hg, Pb, Se, Ni, and Cr, were found at concentrations generally <3.0 ppm dry wt. Hg concentrations were generally <0.2 ppm dry wt. The animals did not contain PCBs, analyzed as Aroclors, at the 5-ppb detection limit. Many pesticides such as toxaphene, DDT compounds, chlordane, and dieldrin were found in these mussels. Most of the concentrations were in the <0.1-ppm wet wt. range; however, the data show that some of these mussels contained toxaphene at concentrations in the 0.2- to 0.4-ppm wet wt. range. The contaminants were not specific to any single site or mussel species but were fairly evenly distributed. Statistical analyses of the contaminants data were used to determine whether the metals or pesticides exceeded the U.S. Food and Drug Administration action limits or the U.S. Fish and Wildlife Service predator protection limits. Based on these analyses and the levels of toxaphene found in some of the species, recommendations were made that the tissues not be used as animal feed.

14. SUBJECT TERMS

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